SANITARY DIAPHRAGM VALVE

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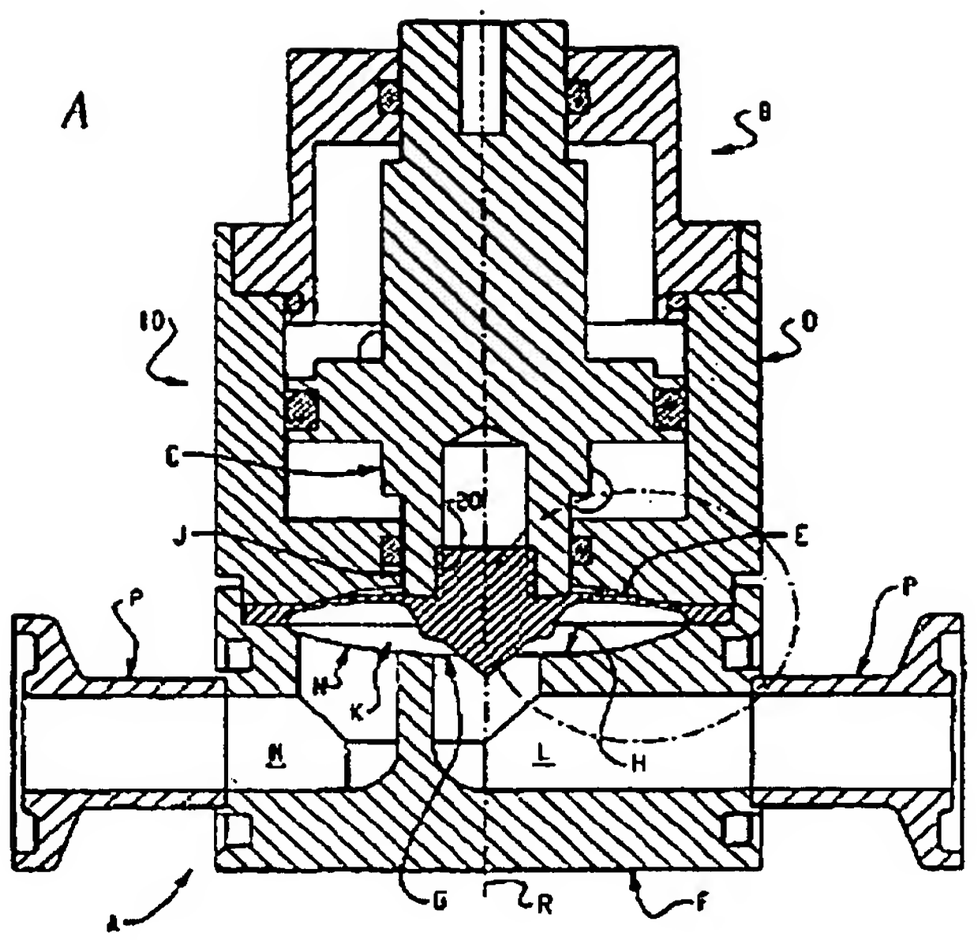
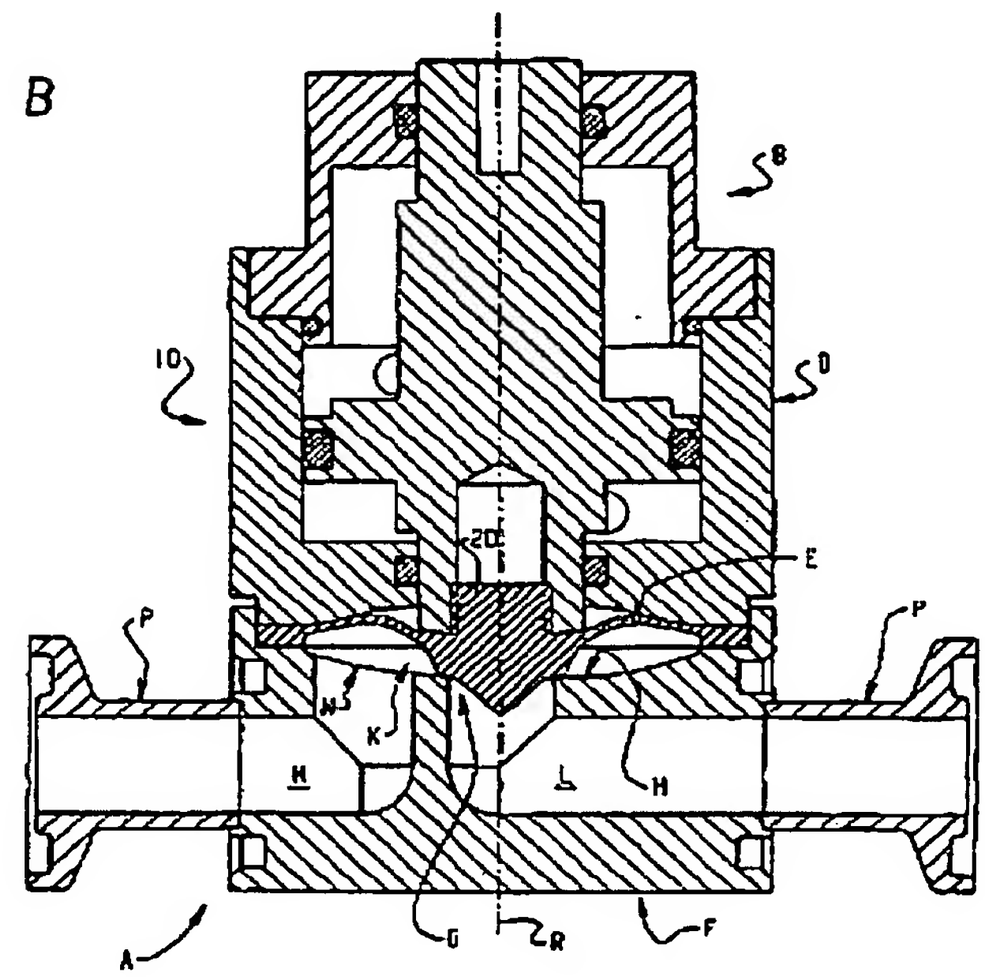
A sanitary diaphragm valve is provided that includes a generally dome shaped diaphragm having a central boss that can be connected to or driven by a valve actuator. The diaphragm includes an outer peripheral edge and a relatively thin web portion that connects the boss to the outer edge. In one embodiment, the web portion is arcuate or dome shaped. The thinner web portion permits the diaphragm to have an extended cycle life and to permit the valve to operate at higher fluid pressures. The thin web may be defined by two different contoured surfaces, one convex and the other concave, such as formed by two radiuses. A valve body is provided that includes a bowl shaped valve cavity. This valve cavity includes an outer vertical edge to permit more thorough cleaning and to eliminate entrapment areas. The valve assembly provides support surfaces for the diaphragm that reduces stress on the diaphragm particularly at higher operating pressures. A deep bowl embodiment is provided in which the valve cavity is defined by a spherical and preferably a hemispherical surface with the cavity diameter being about the same as the diaphragm diameter. The diaphragm for the deep bowl design has a stem tip that seals one of the valve ports radially outward from the port. The port may include a chamfered valve seat adjacent the port, and the port may be formed by a conical bore.





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CLAIMS

[Claim(s)]
[Claim 1] Valve element which has in inside the valve cavity defined by the inner curved surface;
Diaphram which has the perimeter which seals this valve cavity;
The 2nd fluid channel in the valve element opened to this valve cavity by the 1st fluid channel in this valve element opened to this valve cavity by the 1st lot, and the 2nd lot;
****** -- changing -- the valve mandril which this diaphram opens this valve and is closed -- having; this valve mandril in this closing location -- this -- radial diaphragm valve sealed by surrounding the 1st lot to the part of this curved surface that vacated spacing for radial substantially from them.
[Claim 2] the above-mentioned valve mandril -- the above 1st and the above-mentioned field between the 2nd lot -- receiving -- sealing -- and -- this -- the valve according to claim 1 which has a larger diameter than the diameter of the 1st lot.
[Claim 3] The valve according to claim 1 in which the above-mentioned curved surface forms a semi-sphere valve cavity substantially.
[Claim 4] It is the valve according to claim 1 which changes including the curved carbon button which the above-mentioned valve mandril seals to the above-mentioned front face, and has radius of curvature with this bigger carbon button than the radius of curvature of the above-mentioned cavity.
[Claim 5] The spherical valve according to claim 1 in which the above-mentioned curved surface has radius of curvature about equal to the radius of the above-mentioned diaphram.
[Claim 6] The valve according to claim 5 from which the permutation on the straight line from the above-mentioned closing location of the above-mentioned valve mandril to the above-mentioned open position produces the rise of the un-line flow cross section substantially.
[Claim 7] The valve according to claim 6 whose above-mentioned flow cross section is twice [at least] the flow cross section of the 1st fluid channel of the above.
[Claim 8] The valve according to claim 1 opened to this valve cavity in alignment with the central flow shaft with which the 1st above-mentioned lot forms and deflects an angle from the advancing-side-by-side shaft of the above-mentioned valve mandril.
[Claim 9] a part for part II opened to a part for part I and the above-mentioned valve cavity to which the 1st fluid channel of the above was located in a line beside the advancing-side-by-side shaft of the above-mentioned valve mandril -- containing -- changing --; -- this -- the valve according to claim 8 with which the amount of [the 1st and] part II forms a less than 90-degree included angle among them.
[Claim 10] The valve according to claim 9 of which the amount of above-mentioned part II consists including a cone lumen.
[Claim 11] The valve according to claim 10 which changes including the valve seat which adjoins a part for above-mentioned part II, and which beveled.
[Claim 12] The valve according to claim 8 which changes including the valve seat which adjoins the 1st above-mentioned lot, and which beveled.
[Claim 13] The valve according to claim 12 whose 1st above-mentioned lot is an ellipse.
[Claim 14] It is the valve according to claim 1 which forces this valve mandril to this closing location by the above-mentioned valve mandril's moving [centering on between valve disconnection and closing locations], and this valve mandril's consisting of a sealing side and this shaft including the lip part extended horizontally, and forming this sealing side and the field which faced each other when opposite; this ******** is exposed to flow back pressure from this 2nd fluid channel.
[Claim 15] The valve according to claim 14 which operates like [the 1st fluid channel of the above is a valve inlet port, and / the 2nd fluid channel of the above is a valve outlet, and] a check valve in; valve.

[Claim 16] The valve according to claim 1 to which the 1st and 2nd fluid channels of the above are located in a line with the abbreviation same axle.
[Claim 17] The 1st and 2nd fluid channels of the above are valves according to claim 1 which the shaft is deflecting.
[Claim 18] The valve according to claim 1 which the 2nd fluid channel of the above opens with a tangent to the above-mentioned valve cavity.
[Claim 19] The valve according to claim 1 which the 2nd fluid channel of the above opens to the above-mentioned valve cavity along the passage currently horizontally deflected from the above-mentioned valve so that the flow of the fluid to the above-mentioned valve cavity from the above-mentioned 2nd fluid passage may meet the passage except direct in the above-mentioned valve mandril.
[Claim 20] It is the radius diaphragm valve as which it changes including the valve element which has a valve cavity with the 1st and the 2nd lot in inside, and this cavity is determined by the semi-sphere form face.
[Claim 21] It is the valve according to claim 20 to which it grows into including the abbreviation annular diaphram which seals the above-mentioned valve cavity, and this valve cavity has an equal diameter substantially with the diameter of this diaphram.
[Claim 22] The valve according to claim 20 to which the above-mentioned valve cavity has the depth below the radius of curvature.
[Claim 23] The valve according to claim 20 which changes from the one above-mentioned opening to radial including the diaphram which seals one of these the openings in respect of sealing which vacated spacing.
[Claim 24] The valve according to claim 20 whose 1st above-mentioned lot is an ellipse.
[Claim 25] The valve according to claim 20 in which the 1st above-mentioned lot is formed of a cone lumen.
[Claim 26] The valve according to claim 25 which changes including the valve seat which adjoins the above-mentioned cone lumen, and which beveled.
[Claim 27] The valve according to claim 20 which changes including the valve seat which adjoins one of the above-mentioned openings, and which beveled.
[Claim 28] It is the radius diaphragm valve in which it grows into including the annular diaphram which seals valve element; which has the valve cavity formed in inside of the spherical surface, and this cavity as a whole, and this cavity has an equal diameter substantially with the diameter of this diaphram.
[Claim 29] They are the valve element which has in inside the valve cavity formed of a curvilinear side, and the radius diaphragm valve which changes including the annular diaphram which seals this cavity as a whole, and has the depth with; this cavity about equal to the one half of the diameter of this diaphram.
[Claim 30] The valve element which has a spherical valve cavity in inside, and opening which opens to this valve cavity; this opening is a radius diaphragm valve which changes including the annular valve seat which is an ellipse and adjoins; and this opening, and which beveled.
[Claim 31] It is the radius diaphragm valve which answers flow back pressure [as opposed to / are the interior which attached the taper to radial in order that this diaphram mandril might form a lip with this mandril chip, and / this mandril in; this lip], and generates the closing force by changing including annular diaphram with the diaphram mandril and mandril lip for sealing the valve cavity which has opening in inside, and this opening as a whole.
[Claim 32] Valve element which has in inside the valve cavity defined by the spherical side;
Diaphram which has the perimeter which seals this valve cavity;
The 1st fluid channel in this valve element opened to this valve cavity by the 1st lot, and the 2nd fluid channel in this valve element opened to this valve cavity by the 2nd lot;
It changes by ******. This diaphram has the valve mandril which opens a valve and closes.;
this valve mandril of this closing location -- this -- the part of this curved surface that surrounded the 1st lot and vacated spacing for radial from them -- receiving -- sealing --; -- the radius diaphragm valve whose depth of this ball is the abbreviation one half of the diameter of this diaphram here.
[Claim 33] Valve element which has in inside the valve cavity defined by the spherical side;
Diaphram which has the perimeter which seals this valve cavity;
The 1st fluid channel in this valve element opened to this valve cavity by the 1st lot, and the 2nd fluid channel in this valve element opened to this valve cavity by the 2nd lot;
It changes by ******. This diaphram has the valve mandril sealing face which opens a valve and closes.;
this valve mandril of this closing location -- this -- the part of this curved surface that surrounded the 1st lot and vacated spacing for radial from them -- receiving -- sealing --; -- the radius diaphragm valve these

whose sealing faces are or less about 5 of the diameter of this cavity / 8 here.
[Claim 34] Valve element which has in inside the valve cavity defined by the spherical side;
Diaphram which has the perimeter which seals this valve cavity;
The 1st fluid channel in this valve element opened to this valve cavity by the 1st lot, and the 2nd fluid channel in this valve element opened to this valve cavity by the 2nd lot;
It changes by ******. By movement of the valve mandril which met the shaft in the stroke defined beforehand, this diaphram opens a valve and has the closed valve mandril.;
this valve mandril of this closing location -- this -- the part of this curved surface that surrounded the 1st lot and vacated spacing for radial from them -- receiving -- sealing --; -- the radius diaphragm valve this whose stroke is below abbreviation one half of the radius of this diaphram here.
[Claim 35] It is the valve element to which it has valve cavity; and the diaphram valve element sealing side annular as a whole which are formed in inside of a spherical side in inside, and this cavity has an equal diameter substantially in the diameter of this diaphram valve element sealing side.
[Claim 36] It is the valve element which has the valve cavity formed in inside of a spherical side, and the depth whose; this cavity is the abbreviation one half of the diameter of this diaphram valve element sealing side with an annular diaphram valve element sealing side generally.
[Claim 37] Opening and this opening which are opened to a spherical valve cavity and this valve cavity to inside are a valve element with the annular valve seat which is an ellipse and adjoins; and this opening and which beveled.
[Claim 38] The valve element which has the valve cavity as which a cavity is substantially determined by the semicircle spherical surface, and which has the 1st and the 2nd lot in inside.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
(Technical field)
related application the United States patent application 09th about the sanitary diaphragm valve (SANITARY DIAPHRAGM VALVE) for which it applied on January 14, 1999 whose this application asserts the United States patent temporary application 60th / profits of No. 103,772 about the sanitary diaphragm valve (SANITARY DIAPHRAGM VALVE) (processing numbers 22188/05604) for which it applied on October 8, 1998 / No. 231,683 -- it is continuation application a part and these the indications of all are completely included in this specification by citation. This application asserts the United States patent temporary application 60th / profits of No. 192,785 about the sanitary diaphragm valve (SANITARY DIAPHRAGM VALVE) for which it applied on March 28, 2000 again, and the indications of all are completely included in this specification by citation.
[0002]
Technical field of invention This invention relates to a radial (radial) diaphragm valve. More, it is easy to defecate this in a detail for the sanitary diaphragm valve in which this invention contains the diaphram of dome shape, and the valve cavity of a ball form, has a long activity life (cycle life) and the higher rate of flow in it, and has in it other various descriptions which offer the diaphragm valve which can be operated more with high pressure.
[0003]
Background of invention For example, while it is in a sterilization condition, clean and the system which deals with a fluid by the activity life and operating pressure which went up are required of biotechnology, a semi-conductor, medicine manufacture, food processing, and various fields like medicine. I hear that very important consideration can defecate fluid handling components easily, and there is. a system can defecate easily -- inside -- conflicting -- the death capacity of the reason minimum -- and it shuts up and is dependent on area. Moreover, the body of this fluid handling system must be carried out to a fluid, and an inactive component must be used for it. Such a system especially often uses a control-of-flow device as a valve, and a diaphragm valve is used in many cases.
[0004]
A U.S. Pat. No. 5,549,134 specification (it will be called "134" patents from now on) (these the indications of all are completely included in this specification by citation) indicates the design of the diaphragm valve fully especially applied to sanitary application of these versatility. This invention is aimed at the various descriptions in the design of the valve of "134" patents improved and added in order to strengthen a detergency and the operability ability which especially includes an operating pressure property and an activity life (cycle life). Furthermore, it is aimed at this invention gathering the rate of flow.
[0005]
Epitome of invention In order to attain the above-mentioned purpose, this invention follows like 1 voice and the sanitary diaphram containing the diaphram of the dome shape which has the comparatively thin web part which is connected with a valve-action machine or connects with a periphery field the central boss, periphery field, and boss who may drive by that cause is offered. In one mode, a web part is a segment or dome shape. Diaphram has a long activity life by the thinner web part, and it can be operated now by fluid pressure with a higher valve. According to another viewpoint of this invention, a thin web can be defined according to many curved surfaces. In one mode, it realizes by two surface type voice with the radius of curvature from which many curved surfaces differ.
[0006]

According to the further viewpoint of this invention, the valve element containing the valve cavity of a ball form is offered. This valve cavity enables more thorough defecation and includes the outside cross-section form which shuts up and eliminates area. In a suitable mode, a cross-section form is realized outside a valve cavity in the state of an edge perpendicular to the real target connected with the cavity by smooth transition like a radius.
[0007]
In the further mode of this invention, housing of an actuator offers the back face about the diaphram which lowers the stress of diaphram by higher operating pressure especially.
[0008]
According to another viewpoint of this invention, the design of a deep ball cavity with the diaphram which seals one outside of a valve port to radial is used. Opening (off-axis) is enabled for this concept to improve the rate of flow generally, and for a shaft to shift to a valve cavity, in order to eliminate the elbow inlet port of a right angle again, and to open. Furthermore, the viewpoint of this invention is the diaphram mandril which cut the lower part, in order to offer the surface area hurried in the location which closed valve diaphram in response to back pressure (urges). This description can be used again, also in order to realize a check valve.
[0009]
These, and other viewpoints and advantages of this invention will make an attached drawing reference, and will become clear to this contractor from explanation of the following suitable modes.
[0010]
Detailed explanation of a suitable mode Drawing 1 A is made reference and a sectional view explains concretely the mode of the diaphragm valve by this invention, and the actuator assembly 10. Valve A and the valve-action machine B are included in an assembly 10. In order to operate the diaphram E in a valve element F, the mandril C of the valve-action machine which moves [centering on the inside of the actuator housing D] is included in Actuator B. A valve element F and the actuator housing D are attached together, and form the collected valve A. Diaphram E closes Opening G by pushing so that it may gear to the valve seat field H (please make drawing 1 B reference). The general structure of the valve assembly 10 and actuation are indicated by patent"134 quoted above, and are not repeated in this specification. However, the actuator housing D, Diaphram E, and a valve element F have much qualification compared with the structure where "134 patent corresponds, and indicate it in a detail on these specifications. however -- this invention -- depending -- diaphram -- " -- 134 -- a patent -- a valve -- receiving -- others -- qualification -- nothing -- " -- 134 -- a patent -- diaphram -- a change -- and -- it -- placing -- changing -- many -- application -- it can be used -- a thing -- it should observe -- and it -- meaning .
[0011]
Many the alternative-like modes or examples exist in this specification, and such an example should not mean and interpret that it is a comprehensive example. Even if many modification electric, mechanical, and like an ingredient to the mode to indicate mentions this specification clearly and it is not, it is easily clear to this contractor, and such modification can be created, without deviating from the instruction and the range of this invention. Furthermore, the each can use it for this invention apart from other one or more viewpoints of this invention including the viewpoint from which a large number differ, combining.
[0012]
Although it is a pneumatic pressure-type actuator, the valve of this invention can be operated in the format of the convenient arbitration for a designer, and, as for.the actuator B in this mode, inclùdes electrochemical actuation, an oil pressure controller, a pneumatic pressure type, hand control, etc. in it. Therefore, the detail of actuation of Actuator B is not essential to this invention except for the mandril C of an actuator containing the diaphram supporting structure so that it may indicate in a detail below according to one viewpoint of this invention. If you understand that the mandril C of a valve-action machine moves in accordance with a shaft (setting to drawing of drawing 1 A perpendicularly) for the purpose of this explanation so that Diaphram E may gear to a valve seat H or it may separate, it is enough for it. The mandril C of a valve-action machine includes the chip J which supports diaphram so that it may explain below.
[0013]
The fundamental valve assembly 10 contains the valve element F which has the valve chamber or Cavity K further formed in inside which is indicated by the "134 patent. Diaphram E is used in order to seal this cavity K. The fluid channel L of an inlet port is opened to the valve cavity K at the inlet port G. The fluid channel M of an outlet is opened to the valve cavity K at Outlet N. the suitable fitting P -- using it -- the

fluid of the upstream and a lower stream of a river -- fluid bundle connection (fluid tight connection) of a valve can be offered to a conduit or other control-of-flow devices (not shown).
[0014]
Drawing 2 A and 213 are made reference, and the mode of the diaphram E by this invention is concretely explained to a detail. When it generally compares with the diaphram of "134 patent, the diaphram E of this invention is a disk form a little, and includes the periphery field connected with a boss 12 by the central actuator boss 12 and the web part 16, or an edge. however -- contrastive -- Diaphram E -- general -- dome shape -- or -- a half -- since it has - toroid web part 16, Diaphram E is non-plane substantially. Diaphram E is preferably symmetrical about a medial axis R, and this shaft's corresponds with the major axis of the mandril of an actuator (drawing 1 A).
[0015]
Drawing 2 B is made reference and it lets the diaphram central boss 12 pass outside by 18. thereby -- Diaphram E -- the actuator chip J -- a screw lump -- being possible (threadably) -- it can connect. Chip J has the corresponding internal screw thread 20 (please make drawing 1 A reference). Other techniques for connecting diaphram with the actuator chip J can be used in alternative.
[0016]
The central boss 12 extends from a part for the central diaphram soma 22. The cone chip 24 is formed in the end of the central diaphram object 22 which is a boss's 12 opposite side. As for the cone chip 24, a boundary is defined by the annular sealing surface 26. The cone chip 24 improves the rate of flow of the fluid which passes along a valve. Other geometric profiles of a chip 24 may be used. For example, it is round or truncated (frusto) - cone chip which may be a cone form with a radius chip can be used. The specific profile to choose will be dependent on the flowing characteristic for which a valve designs and asks.
[0017]
A periphery 14 is offered by the circumference rim 28 in this instantiation-mode. This rim 28 is connected with centrosome 22 by the web 16 of continuous dome shape. As concretely explained in drawing 213, a web 16 is a comparatively thin member which has the convex external surface 30 which separates from valve KYABIIK and faces, when diaphram is attached in a valve element like drawing 1. A web 16 also has the concave inside 32 which faces valve KYABII K, when diaphram is attached in a valve element like drawing 1 again. It means that a web 16 is more substantially [than the rim 28 and centrosome 22 of diaphram] as thin as "comparatively thin." This thin web 16 raises the flexibility of Diaphram E substantially in this way.
[0018]
According to one viewpoint of this invention, a web 16 has the un-homogeneity thickness 34 along the radius range between centrosome 22 and a rim 28. Or a web may have uniform thickness substantially between centrosome 22 and a rim 28. Although there is surely no web 16 then, preferably, it is the thinnest in the central field 36, and becomes thick gradually to the field which a web 16 connects with the central part 22 and a rim 28. According to this structure, although a web 16 is very flexible, concentration of the stress in the inclination which becomes weak by much actuation is avoided.
[0019]
It is attained when fluctuating the thickness of a web 16 forms an inside in the 2nd zero 40 in accordance with the 2nd radius 38 which places a core by forming external surface 30 in the 1st zero 44 in accordance with the radius 42 which places a core. In the mode of drawing 213, zeros 40 and 44 are arranged in a different space position, and the 1st radius 38 of a twist is [zeros] short in the 2nd radius 42. However, these can only be examples and can be the points that zeros 40 and 44 are the same about specific diaphram. By such another design that has the same zero, the outside and the insides 30 and 32 which are these alignments are produced in the central part of a web 16. This contractor will think that it is realizable in the format except the web 16 of dome shape forming front faces 30 and 32 in accordance with a radial section form. Dome shape is realizable in the format of the arbitration which uses the segment, other cross-section forms, or geometry which generates convex form external surface and a concave inside.
[0020]
the top face 30 of a web 16 -- a radius 46 -- or it connects with a rim 28 by other transition mixed smoothly. The internal concave surface 32 is connected with centrosome 22 by transition of the radius transition 48 or others mixed smoothly. An inside 32 is connected with a rim 28 by a radius 50, other smooth transition, or mixing again. Please note that radius 48 form or transition forms field 48a extended on the radial outside toward a rim 28 from centrosome in this mode.
[0021]

The advantage of a diaphram design of dome shape is a point that a web 16 is not applied to high tensile stress by radial, when diaphram is fixed to a closing location, as concretely explained in drawing 113. The flexibility in which Diaphram E went up also lowers the force of an actuator required again in order to close a valve. This has the additional advantage which raises the isolation pressure grade (rating) of a valve.
[0022]
According to another viewpoint of this invention, a rim 28 is designed so that it may have the "width-of-face w" pair height "h" of about 2 to 1. Since this instantiation-ratio has some ingredients, especially polytetrafluoroethylene (PTFE) in the inclination of ordinary temperature flow, it is useful to ensuring making it a rim 28 not become thick too much. However, the case of diaphram ** of size which there is no interest important for ordinary temperature flow, or is different, or when using other ingredients for diaphram, a rim 28 can be formed by different ratio.
[0023]
Diaphram E can be made from the suitable ingredient of the arbitration which suits the fluid which passes along a valve. It is the modification object with which PTFE embellished the latter at the example including PTFE and TFM. However, although Diaphram E is not necessarily limited, it can be created from the flexibility ingredient containing elastomers, such as EPDM, Buna (trademark), Viton (trademark), etc. which can be mentioned, for example as several examples, and HOSTAFLONRTF (trademark), HOSTAFLONRTFM (trademark), and Teflon NXT (trademark).
[0024]
Drawing 3 and 4 are made reference and the further description of this invention is explained concretely. Drawing 3 is the enlarged drawing of the dotted-line field of drawing 1 A to show the diaphram supporting structure of various views. Drawing 3 expresses the diaphram E before being completely bound tight by the valve assembly, and drawing 4 expresses the same field under a pressure, after diaphram is attached completely.
[0025]
As this specification indicated until now, the advantage with important Diaphram E is use of the thin web 16. This thin web 16 raises the flexibility of Diaphram E substantially. The flexibility besides staged is the smaller closing force about Actuator C (drawing 113), and it makes it possible to carry out the closing location of the diaphram to high pressure more. However, a valve will close the thinner flexibility web 16, and it will turn at it like a bow under various situations of a large number including the time of there being substantial back pressure from the outlet fluid channel M, or it will swell, when open by inlet-port fluid pressure with a higher valve, or when the valve is closed down to higher fluid pressure (drawing 1 B). Therefore, Diaphram E is provided with the supporting structure and it enables it to use the thin web 16 according to another viewpoint of this invention. The diaphram of this invention can be supported using various techniques, and several of the examples are indicated after this.
[0026]
In drawing 3 , the actuator housing D with the diaphram back face 52 is formed. In this mode, a part for the heights 54 of a radial outside which is transferred to a part for the crevice 56 of the radial inside by A1 is included in a back face 52.
[0027]
The actuator housing D contains the almost even bolting part 60 and the even bolting part 58 of the perimeter which operates to coincidence and which faced each other with the even or perimeter of a valve element F. A rim 28 is pinched and compressed between the actuator housing flat part 58 and the valve element flat part 60, in order to do in this way and to bind Diaphram E tight in a valve assembly. As shown in drawing 4 R> 4, when the actuator housing D and a valve element F are fastened together, a rim 28 is compressed and is easily extended with the resiliency of a diaphram E ingredient. The shaft extension section 62 of a valve element offers the wall 64 which adjoins by radial [which gears with the compressed rim 28], and, thereby, prevents the ordinary temperature flow of the rim 28 to a radial outside.
[0028]
In the design of some valves, the actuator housing D does not always adjoin the diaphram top face 30, and will achieve the purpose to which some other structural members (it is (for example, like a bonnet)) of a valve or an actuator bind diaphram tight to an assembly 10 rather. In such a case, this structural member is embellished, diaphram E external surface is covered and the extension or other parts which support are included.
[0029]
The convex diaphram base material part 54 is geared and supported on the diaphram external surface 30, the

beginning and when especially the valve is open (drawing 3 sees like). When there is significant inlet-port fluid pressure from an inlet port G, diaphram turns to a segment up. However, the top face 30 of diaphram contacts a part for heights 56, or it gears, and a superfluous segment is prevented. The part 56 of the radial inside is a concave as exactly in agreement [with the time of the configuration of the diaphram of dome shape, especially diaphram becoming a segment with high pressure]. The concave cross-section form 56 can be carried out in this way, and can support the important part of the external surface inside [radial] Diaphram E. However, this contractor will think that the amount of this crevice is [convex / which may be a part for flatness or heights 54] sufficient so that it may be required of specific application. In a mode with still more suitable drawing 3 , a back face is mostly extended from rim 28 field to the actuator mandril J. However, the design of some valve housing does not make back-face structure of these many possible. Especially, the efforts for a design are the thinnest field 36 and the central boss 12 neighborhood, and should be turned to making area of the support about the outside diaphram side 30 into max.

[0030]

Thus, naturally the cross-section form of the back face 52 explained with a drawing has the intention of being an example. When especially diaphram is under high internal pressure, this cross-section form should be designed so that many may be supported [whether the external surface 30 of diaphram is made and].

[0031]

The actuator chip J can also be used in order to offer a diaphram back face. Chip J gears with the interior of radial of the diaphram E of the boss 12 neighborhood, and in order to support, it includes the inferior surface of tongue which gave the include angle extended on the radial outside, a radius, or other suitable cross-section forms 66, so that drawing 3 may explain concretely.

[0032]

As shown in drawing 3 , the annular sealing side 26 is formed at an include angle alpha from a flat part. A part is defined for this valve chamber K according to the curvilinear ball form cross-section form of a valve element F. The annular valve seat field H contiguous to an inlet port G is formed evenly, or is preferably formed under at an angle of the include angle of the sealing side 26. As the sealing side 26, the edges 70 of a sealing seat with the annular sealing side 26 are those near magnitude that is radial, as mostly contacted in the central field 72. An include angle alpha ensures for a front face 26 to contact with a valve seat 70 and the Rhine seal first. Even if this uses the diaphram E of higher flexibility between the sealing side 26 and a seat 70, high contact pressure is secured. This include angle can be about 11 degrees.

[0033]

As indicated on these specifications until now, a valve element F is formed in the cross-section form 68 of a ball form so that a part of valve chamber K may be defined. As concretely explained in drawing 3 and 4, the diaphram rim 28 is a dimension in which the (drawing 4) and internal radial edge 74 of a rim has the width of face "w" which vacates spacing for the radial inside or is located in a line with the same flat surface as the edge 76 of the valve cross-section form 68 in the state of a bell and spigot. When a rim 28 is compressed between the housing flat part 58 and the body flat part 60 to be shown in drawing 4 , a rim 28 is pushed in so that the inside edge 74 may serve as either which laps with the edge 76 of a cross-section form slightly together with the same flat surface as the edge 76 of a cross-section form. Thereby, the detergency of a valve improves considerably. The rim 28 should be the dimension which is not arranged on the radial outside of the edge 76 of a cavity, when compressed (since it confines in such a condition and a field exists).

[0034]

In addition to forming the array which overlapped slightly level between an edge 76 and the edge 74 inside the diaphram rim 28, a rim 28 is connected with a diaphram web by a radius or the smooth transition 50 finished on the parallel front face 74 substantially [it is desirable and] to the major axis R of diaphram although there is surely nothing then. The edge 76 of a valve cavity is similarly formed preferably of a radius or other smooth transition 80 which are substantially finished with the flow shaft which passes along the major axis R of diaphram and/, or an inlet port N preferably although there is surely nothing then as the end of the parallel front face 78. Transition 80 is transferred to the curved surface 68 of the ball cross-section form where a part of valve chamber is defined, at the end which faced each other. This arrangement improves the detergency of a valve intentionally.

[0035]

Drawing 5 is made reference and another design of the field which thrusts a rim 28 is explained concretely. Drawing 5 R> 5 put the round mark of drawing 3 , especially expresses the enlarged detail of valve element bell-and-spigot side 60 **. In this mode, bell-and-spigot side 60' leans at a certain include angle (from a flat

part to 3). In an instantiation mode, it is an include angle (although 3 is about 3 degrees, other valves for specific application can use 3 if needed.). When [at which the diaphram rim 28 faced field 60' by this] it thrusts and is thrust between fields 58, it secures that sharp marginal 76' contacts a rim 28. It was found out that contact of this sharp edge improves the detergency of a valve in many case.
[0036]
Drawing 6 explains another viewpoint of this invention. As mentioned above, in the design of some valves, a designer does incorporating a back face 52 (drawing 3) by the ability not doing about the diaphram web 16. Or probably a valve element and the body structure of an actuator fully bar the design of the wrap supporting structure 52 for most webs 16, especially most radial inside parts 16 of a web 16. When such, about the valve which can use the supporting structure 52 further, a back-up ring or a disk 82 can be put on the diaphram web 16, and a web can be supported. This ring is good in the group of the single ring formed with a suitable hard ingredient like a metal, or the overlapping ring. These rings 82 can only be put on Diaphram E. A ring 82 can be made into a cross-section form which is more specially in agreement with the curvature of the outside convex 30 in the cross-section form which has not required the stress of the dome shape web 16 as shown in drawing 6 . In the mode of drawing 6 , a ring 82 is extended to a boss 12, and this is certainly held with the actuator chip J. Although not necessarily limited to other available selections, without extending all the time to a boss 12, it is inserted outside a ring in the side by other means by which a ring fixes the outside convex 30 to the external surface of the actuator housing D or diaphram by having the wrap ring 82 gently, and may be maintained.
[0037]
Drawing 7 A-C explains actuation of the flexible diaphram E concretely. These drawings are based on an element with measurable diaphram, while simulating an operating condition. Therefore, the shown structures are some of Diaphrams E, actuator chips J, and bodies D of an actuator. In drawing 7 A, Diaphram E is in the condition completely opened by the inlet-port fluid pressure of about 65 psi(s). Please note that the diaphram web 16 is substantially supported by the supporting structure 52 of the body of an actuator, and the cross-section form face 66 of the actuator chip J. In drawing 7 B, Diaphram E is in the condition completely closed with the internal pressure of about 65 psi(s). Although the diaphram web 16 has swollen substantially first, please note that most webs are supported to the cross-section form face of a back face 52. Although drawing 7 C is the location closed completely, the diaphram of the internal pressure of about 120 psi(s) is explained concretely. This is pushed on the connection whose supporting structure 52 supports more webs although a web 16 swells further with high pressure more. Thus, the thin web diaphram E fully functions also by higher operating pressure. It becomes still easier about closing diaphram 16 to such twist high pressures by the thinner flexible web.
[0038]
Drawing 8 explains another design of Diaphram E concretely. All the descriptions of Diaphram E are the same as the mode of drawing 2 B except for the transition field between a web 16 and centrosome 22. This thin web 16 greatly increases the flexibility of Diaphram E. However, further more big flexibility is desired in some modes. In such a case, web 16 concave surface 32 is connected with centrosome 22 by a radius 90 or other smooth transition. However, in this case, transition 90 forms the front face 92 extended to the radial inside which goes to centrosome 22, or is transferred to it and forms lower cutting of centrosome 22. It does in this way by this arrangement, and as compared with the mode of drawing 2 B, between a web 16 and centrosome 22, substantial more thin connection or transition is offered, it does in this way, and the flexibility of diaphram goes up. This compensation is lower cutting confining and offering the field where care and cleaning is difficult by the field or some application.
[0039]
Drawing 9 A-9D explains the mode of diaphram concretely further. By drawing 9 A-9C, the open position which has not required the pressure for a valve, the open position of the valve under a pressure, and a closing location explain Diaphram E, respectively. In this mode, the back face 200 formed into actuator housing includes the annular impression 202 in this mode. This annular impression 202 receives the diaphram top face 204, and it can be arranged so that it may support, and when a valve is under a pressure, and when diaphram is in an open position, this becomes a bow intentionally or can swell. In order to offer sufficient support, the configuration of this impression 202 is chosen so that it may be in agreement with diaphram at the highest. The transition to a part for heights 206 is further included in a back face 200 as in other modes indicated on these specifications.
[0040]
The valve concretely explained by drawing 9 A-9C is a larger valve than the valve concretely explained

with other drawings of this specification. That is, the main boss 208 of a bigger diameter is included in Diaphram E. Therefore, the back face 200 is provided with the corresponding flat part 210 which can be engaged on a boss's 208 top face 212 when diaphram is an open position like drawing 9 A and 9B. It will depend for the diameter of these flat fields 210 and 212 on the size of diaphram and a valve. Although drawing 10 A-10E explains concretely various examples of the change in the diaphram (drawing 10 A is a bigger valve to drawing 10 E being a smaller valve) of different size, and arrangement of a corresponding back face, it shares the basic feature of this invention which all diaphrams indicated on these specifications in the top.

[0041]

In the mode of drawing 9 A-9C, the periphery field 14 is formed in the up notch or impression 96 formed in the rim 28. Drawing 9 D expresses the enlarged drawing of a notch 96. The periphery is continuing preferably and this notch 96 is uniform, although there is surely nothing then. A notch 96 defines the tab part 98 of a periphery. In order to function as centering on the diaphram E in a valve element F correctly before a tab 98 screws in the actuator housing D, the diameter of a tab 96 is chosen so that it may fit into the wall 64 of a valve element exactly or a way may fit in (drawing 3). When it connects with a valve element F and the actuator housing D carries out exaggerated torque of the notch 96, it is made to deform Diaphram E all over a field 100. Diaphram can deform all over a field 102 by the case, and this is not so desirable without a notch 96 about the overall engine performance of diaphram. That is, a notch 96 can be a configuration which explains concretely on these specifications and is used by/or the various diaphram designs to indicate.

[0042]

Drawing 11 and 12 are made reference and one of the limitations of the radius diaphragm valve of arbitration vacates an inlet port, and in order to close, it is the amount of the stroke which needs to be applied to diaphram. When this increases like a limping gait partially, diaphram must be flexibility and further especially a valve is a closing location, it is generated from the ability of the operating pressure of a fluid to be borne. Therefore, the stroke which can be used in order to open a valve is restricted very much, lowers the rate of flow of a valve next, or this tends to limit. Since it is more substantially [than the radius of curvature of other modes the radius of curvature of a cavity indicated drawing 11 and 12 to be until now according to another viewpoint of this invention] small, this specification explains concretely another valve cavity design called deep ball.

[0043]

In drawing 11 and 12, the valve assembly 300 contains Valve A and the valve-action machine B. Although Actuator B is an air actuator in this mode, the suitable actuator of arbitration may be used with this invention. In order to operate the diaphram in a valve element F, the actuator piston C which exercises for shaft orientations within the actuator housing D is included in the valve-action machine B. Communication of the fluid between the 1st lot H and the 2nd lot I is opened, and in order to close, Opening H is opened to Diaphram E and the closed mandril chip G is included in it. Although a valve can be operated with any opening which is an inlet port, in almost all application, the 1st lot H is used as an inlet port.

[0044]

Although Diaphram E is embellished a little from the above-mentioned mode indicated on these specifications (and it explains to a detail further by the following), the concept of a deep ball can be used by the suitable diaphram design of arbitration. Furthermore, this invention can also realize the metal or plastics valve containing a metal or a plastics valve element, and /diaphram. According to the viewpoint of the deep ball of this invention, a valve element F has the curved valve cavity side 302 in inside on the general target which forms the valve cavity 308 sealed by carrying out an overlay lei to Diaphram F. Although there is surely nothing then, a field 302 is a curve and preferably spherical in the mode of concrete explanation. Although other geometric gestalten can be used about application of a special valve if needed, the cavity profile which attains the high rate of flow is offered rather than it wants being easy to build a spherical profile by machine in comparison, and maintaining the outstanding detergency. In the instantiation-mode of drawing 11 , the cavity side 302 forms a perfect true semi-sphere in the real target which has a diameter almost equal to the diameter of the diaphram E formed of the common-law marriage 304 of the circumference rim 306 (the circumference rim 306 should make reference drawing 4 R> 4 which forms sealing of a body about Valve A, when compressed to an annular sealing side or an annular flat part 60). It is desirable to double a field 302 just or to hold over it slightly, after the valve-action machine D and a valve element F are completely collected in the maximum detergency together on the edge 304.

[0045]

When the cavity side 302 is a semi-sphere substantially, the transition section 80 and the edge wall part 78 which more specifically made drawing 3 R> 3 reference, and was indicated on these specifications do not have the need. This is because the semi-sphere ball side 302 is joined to Diaphram E by the interface 305 which has an parallel tangent substantially on Shaft Y.

[0046]

The concept of this deep ball is realizable also with the geometric gestalt of other cavities 308 other than a semi-sphere. For example, a field 302 can be defined with a radial or an ellipse function. A field 302 may also contain spherical or the part at which others turned, and one or more cylinder parts. Therefore, the concept of a deep ball means the following one or more descriptions in the more general vocabulary. Namely, sealing face diameter 310(please carry out drawing 12 and the examination there to reference); which is or less about 5 of the diameter of Z (drawing 11); dimension 2 curved surface 302 of the depth of the ball which is below abbreviation one half of the diameter of Diaphram E by the interior rim 304 of one / 8 And the stroke of the diaphram E which are or less about 1 of the radius of Diaphram E / 2 in three common-law marriage 304. Although it is larger than the radius of Diaphram E or the depth of the ball of the following can be used [whether the further machine manufacture is needed, and a part for a straight cylinder wall is formed (when the depth is larger than the radius of diaphram), and] Or the optimal detergency in the rim 28 neighborhood can be preferably ensured mostly using the transition 80 and 78 to a perpendicular part (when the depth is smaller than the radius of Diaphram E). In the case of the true semi-sphere 302, this depth is substantially the same as a diaphram radius (within the usual manufacture tolerance).

[0047]

The 1st lot H is opened to the valve cavity 308 near the bottom of the cavity which faced the valve-action machine D. According to one viewpoint of this invention, the diaphram chip G seals the field of the ball side 302 which had the larger diameter than Opening H, and is a radial outside or spacing opened from Opening H (please make drawing 12 reference). Chip G is sealed preferably in the 1st and the location which it is the 2nd lot between radial [of H and I], or in the middle of between. In order that Chip G may perform the Rhine seal, it may be provided in a convex radius or other cross-section forms (not shown). When using it, the chip G radius should be larger than the radius of the cavity side 302.

[0048]

When Diaphram E is lengthened by the actuator mandril C and a valve is opened by having a chip G seal combining the design of the radial outside of the 1st lot H, and a deep ball, the cross section of big flow is substantially open to Opening H. For example, the ratio of 2:1 flows with the cross-section flow area in a cavity 308 (cross-sectional flow area), and may be attained between the cross-section flow area of a lumen 312. if it puts in another way -- a shallow ball design -- comparing -- the line of the same quantity of the actuator D -- a stroke gives a substantial more big cross-section flow area to the fluid from Opening H. The spherical design of the smaller cavity 308 of a diameter attains the increment in the cross-section flow area of a non-line substantially, when Chip G is pulled out from Opening H and a valve is opened. The further strengthening for improving the flow which passes along a valve is optimum-izing the location of the valve mandril chip G to Outlet I. When it puts in another way and a valve is in an open position, the mandril chip G can be designed so that it may deflect or assist orienting the flow from the 1st lot H to the 2nd lot I. If the mandril chip G is arranged to opening I passage so that too highly, turbulence will take place, and if Chip G is too low to Opening I, flow will be restricted superfluously. Preferably, Opening I is arranged as much as possible near opening H, and on the other hand, in order that Chip G may open and seal spacing from Opening H to radial substantially, it makes sufficient field possible. Moreover, it is desirable to create the incident angle of the opening I shallow in the ability to do in many case.

[0049]

another voice of this invention -- there needs to be no opening H at the core on the line of the diameter of a cavity 308 correctly by following like and offering the sealing field of a radial outside from Opening H. When it puts in another way, there is opening sealed by the diaphram mandril G at the core on the shaft on the same line as the advancing-side-by-side shaft of Mandril G in a typical radius diaphragm valve. This is produced from the fact that the mandril must seal with the opening. However, in this invention, in order to arrange Opening H in Opening H, the sealing field 310, and the cavity side 311 that is in between, much alternative can be used. For example, in drawing 11 , it is the included angle which the 1st lot opens at an angle of [theta] flow and by which it is formed in this with the medial axis X of opening, and the advancing-side-by-side shaft Y of the mandril chip G. That is, Opening H can be opened the include angle except being at the core on the advancing-side-by-side shaft Y. Thereby, 90 exclusion of an elbow between

the inlet-port path 312 of a valve and the lumen 314 which forms Opening H is enabled. If the elbow of 90 degrees is eliminated, the rate of flow will be improved and waste fluid and a detergency will also be improved again.

[0050]

According to the further viewpoint of this invention, the diaphram mandril G contains the radial lower cutting part 316 (please make drawing 12 reference). Since the mandril has a bigger diameter with Chip G, lower radius-like cutting only means having a taper inside along with the mandril until it connects it with the web part J of Diaphram E. This lower cutting 316 offers the perimeter side field 318 beside how many minute which faces Chip G. This perimeter side field 318 is exposed to the fluid back pressure of the arbitration from the 2nd lot I in this way. It hurries that this back pressure is in the inclination which applies the force to the cardiac shaft surface 318 (drawing 12), and a valve closes it when diaphram is in a closing location. It is useful to this force ensuring seal by 310, without being able to exceed easily the force applied by Actuator B, in order for Opening H to close a valve to fluid pressure, and this needing the actuator of the high closing force. The 1st lot H is used as an inlet port, and in the special case where the 2nd lot I is used as an outlet, since ** from Outlet I closes a valve by applying the force to the opposite side 318, as for the lower cutting mandril, a diaphragm valve makes it possible to function as a check valve or a relief valve. When the opposite side 318 formed of lower cutting does not need to be perpendicular and is exposed to fluid pressure to the mandril from the rather bigger 2nd lot I than the pressure in Opening H, a front face only needs to demonstrate the closing force of shaft orientations on Mandril G.

[0051]

In drawing 11 and the mode of 12, the 1st fluid channel 312 is located in a line in accordance with the 2nd fluid channel 320 and a shaft, and forms an in-line valve element. Subsequently, the 2nd fluid channel contains the part 322 which attached the include angle opened to Opening I so that Opening I may open in the field on the sealing field 310. Drawing 13 explains another mode about the array of the opening shifted concretely. In this mode, generally, although the 2nd fluid channel 320 is formed in the flat surface which is parallel to the axial plane of the 1st fluid channel, it is not the same axle, and the shaft is shifted rather. In this case, the 2nd fluid channel 320 is straightly opened to the 2nd lot I. The 2nd lot I has shifted horizontally from the mandril chip G by opening with a tangent a little to the valve cavity 308 also in this case as best shown in drawing 14 . When the 2nd lot is used as an inlet port, flowing fluid does not go to the diaphram mandril G from the 2nd lot I, and a vortex is strengthened with this format around the spherical side 302, and defecation and purging are strengthened with it.

[0052]

Then, drawing 13 and 14 are made reference and the valve seat 324 which beveled to the 1st lot H is included in this mode. The diaphram mandril chip G offers effective sealing to taper **** and the valve seat 324 which beveled by 326. A valve seat 324 offers sealing of the shape of a radius which adjoins Opening H compared with the sealing field 310 which inclined toward radial [in the mode of drawing 11].

[0053]

Probably, Opening H has the profile of a non-round shape like an ellipse, when the 1st lot H is made on the shaft X of arbitration other than the central bottom of a ball (meeting Shaft Y). Drawing 15 A and 15B explain this effectiveness concretely. The lumen 314 which attached the include angle connects with the inlet-port path 312 in drawing 15 A. The lumen 314 which attached the include angle forms Opening H by crossing the spherical side 302 at an include angle (for example, the include angle theta of drawing 11). The circular lumen 314 is carried out in this way, and forms the opening 350 of an ellipse in Opening H (drawing 15). Beveling 324 is about formed in the opening 350 of an ellipse, and provides Mandril G with a sealing field. Although there is a small level difference 352 formed in the connection section of ellipse opening and beveling 324, this level difference is min and is passed easily. When, as for Mandril G, such actuation is needed irrespective of the incident angle theta by offering the field 324 which adjoined Opening H and beveled, it can be used in order to form sealing with Opening H (comparing with sealing in the location 310 which opened spacing in radial from Opening H).

[0054]

According to another viewpoint of this invention concretely explained by drawing 16 , Opening H can be formed by making the cone lumen 328 opened to the lumen 312 of flow. Use of the cone lumen 328 increases the whole flow which passes along a valve. There is a cone lumen 328 at the core on Shaft Y, or it may incline at an include angle theta if needed.

[0055]

the amelioration of versatility [contractor / this] of this invention, and a viewpoint -- application of a

specific valve according to an individual -- the need and ****** -- it can be used like, combining mutually.
[0056]
This invention made the suitable mode reference and indicated it. Clearly, if you read and understand this specification, other qualification and modification will arise. Such qualification and modification have them within the limits of said application for patent, and it means that all are included as long as it is those equal objects.
[0057]
This invention can take the physical gestalt of the array of a specific part and a part, and the suitable mode and suitable approach are indicated on these specifications at a detail, and an attached drawing explains concretely.
[Brief Description of the Drawings]
[Drawing 1]
Drawing 1 A and 1B explain concretely a diaphragm valve including many descriptions of this invention by the front view and the vertical cross section (a valve is an open position in drawing 1 A, and is a closing location in drawing 1 B).
[Drawing 2]
Drawing 2 A and 2B are detailed explanation of the cross section which met the plan of the diaphram used with the valve of drawing 1 according to this invention, and line 2B-2B of drawing 2 A, respectively.
[Drawing 3]
It is the sectional view which expanded the dotted-line field of drawing 1 A before thrusting diaphram into a valve element completely.
[Drawing 4]
Like drawing 3 , diaphram is completely thrust into a valve element, and diaphram is a closing location and, moreover, is under a pressure.
[Drawing 5]
It is the enlarged drawing of another mode of a diaphram bell-and-spigot side.
[Drawing 6]
Another viewpoint of this invention for offering the support for a diaphram web is explained concretely.
[Drawing 7]
Drawing 7 A-7C explains actuation of flexible diaphram concretely under various operating conditions based on the limited element analysis.
[Drawing 8]
According to another viewpoint of this invention, another mode of diaphram is explained concretely.
[Drawing 9]
Drawing 9 A-9D explains the further mode of diaphram concretely.
[Drawing 10]
Drawing 10 A-10E explains the diaphram of various sizes by this invention concretely.
[Drawing 11]
The further mode of this invention which used the concept of a deep ball expressed in a vertical section and a valve open position is explained concretely.
[Drawing 12]
The valve of drawing 11 in a valve block location is explained concretely.
[Drawing 13]
Another mode of the valve element of drawing 11 containing cone fluid opening is explained concretely.
[Drawing 14]
The design of another valve of drawing 13 containing the valve explained in the valve block location is explained concretely.
[Drawing 15]
Drawing 15 A and 15B explain concretely the arrangement of another opening for which un-circular opening is adjoined and beveling is used.
[Drawing 16]
The arrangement of another opening used in order that a cone lumen may form one of the valve ports is explained concretely.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

WRITTEN AMENDMENT

[Procedure revision] The decodement presentation document of the 34th article amendment of Patent Cooperation Treaty
[Filing Date] April 19, Heisei 14 (2002. 4.19)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[The contents of amendment]
[Claim(s)]
[Claim 1] It is spherical with radius of curvature almost equal to the radius of diaphram.
Valve element which has in inside the valve cavity set by the curved surface to inside;
Diaphram which has the perimeter which seals this valve cavity;
The 2nd fluid channel in this valve element opened to this valve cavity by the 1st fluid channel in this valve element opened to this valve cavity by the 1st lot, and the 2nd lot;
It changes by ******.
This diaphram has the valve mandril which opens a valve and closes,
Radial diaphragm valve.
[Claim 2] The valve according to claim 1 to which the above-mentioned valve mandril seals to the above 1st and the above-mentioned field between the 2nd lot, and has a larger diameter than the diameter of the 1st above-mentioned lot.
[Claim 3] The valve according to claim 1 in which the above-mentioned curved surface forms a semi-sphere valve cavity substantially.
[Claim 4] It is the valve according to claim 1 which changes including the curved carbon button which the above-mentioned valve mandril seals to the above-mentioned front face, and has radius of curvature with this bigger carbon button than the radius of curvature of the above-mentioned cavity.
[Claim 5] The above-mentioned valve mandril of the above-mentioned closing location surrounds the 1st above-mentioned lot, and is **.
** substantially sealed from ** et al. to the part of the above-mentioned curved surface in which spacing was opened to radial
A valve given in **** 1.
[Claim 6] The valve according to claim 5 from which the permutation on the straight line from the above-mentioned closing location of the above-mentioned valve mandril to the above-mentioned open position produces the rise of the un-line flow cross section substantially.
[Claim 7] The valve according to claim 6 whose above-mentioned flow cross section is twice [at least] the flow cross section of the 1st fluid channel of the above.
[Claim 8] The valve according to claim 1 opened to this valve cavity in alignment with the central flow shaft with which the 1st above-mentioned lot forms and deflects an angle from the advancing-side-by-side shaft of the above-mentioned valve mandril.
[Claim 9] a part for part II opened to a part for part I and the above-mentioned valve cavity to which the 1st fluid channel of the above was located in a line beside the advancing-side-by-side shaft of the above-mentioned valve mandril -- containing -- changing --; -- this -- the valve according to claim 8 with which the amount of [the 1st and] part II forms a less than 90-degree included angle among them.
[Claim 10] The valve according to claim 9 of which the amount of above-mentioned part II consists including a cone lumen.

[Claim 11] The valve according to claim 10 which changes including the valve seat which adjoins a part for above-mentioned part II, and which beveled.
[Claim 12] The valve according to claim 8 which changes including the valve seat which adjoins the 1st above-mentioned lot, and which beveled.
[Claim 13] The valve according to claim 12 whose 1st above-mentioned lot is an ellipse.
[Claim 14] It is the valve according to claim 1 which forces this valve mandril to this closing location by the above-mentioned valve mandril's moving [centering on between valve disconnection and closing locations], and this valve mandril's consisting of a sealing side and this shaft including the lip part extended horizontally, and forming this sealing side and the field which faced each other when opposite; this ******** is exposed to flow back pressure from this 2nd fluid channel.
[Claim 15] The valve according to claim 14 which operates like [the 1st fluid channel of the above is a valve inlet port, and / the 2nd fluid channel of the above is a valve outlet, and] a check valve in; valve.
[Claim 16] The valve according to claim 1 to which the 1st and 2nd fluid channels of the above are located in a line with the abbreviation same axle.
[Claim 17] The 1st and 2nd fluid channels of the above are valves according to claim 1 which the shaft is deflecting.
[Claim 18] The valve according to claim 1 which the 2nd fluid channel of the above opens with a tangent to the above-mentioned valve cavity.
[Claim 19] The valve according to claim 1 which the 2nd fluid channel of the above opens to the above-mentioned valve cavity along the passage currently horizontally deflected from the above-mentioned valve so that the flow of the fluid to the above-mentioned valve cavity from the above-mentioned 2nd fluid passage may meet the passage except direct in the above-mentioned valve mandril.
[Claim 20] It is the radius diaphragm valve as which it changes including the valve element which has a valve cavity with the 1st and the 2nd lot in inside, and this cavity is determined by the semi-sphere form face.
[Claim 21] It is the valve according to claim 20 to which it grows into including the abbreviation annular diaphram which seals the above-mentioned valve cavity, and this valve cavity has an equal diameter substantially with the diameter of this diaphram.
[Claim 22] The valve according to claim 20 to which the above-mentioned valve cavity has the depth below the radius of curvature.
[Claim 23] The valve according to claim 20 which changes from the one above-mentioned opening to radial including the diaphram which seals one of these the openings in respect of sealing which vacated spacing.
[Claim 24] The valve according to claim 20 whose 1st above-mentioned lot is an ellipse.
[Claim 25] The valve according to claim 20 in which the 1st above-mentioned lot is formed of a cone lumen.
[Claim 26] The valve according to claim 25 which changes including the valve seat which adjoins the above-mentioned cone lumen, and which beveled.
[Claim 27] The valve according to claim 20 which changes including the valve seat which adjoins one of the above-mentioned openings, and which beveled.
[Claim 28] It is the radius diaphragm valve in which it grows into including the annular diaphram which seals valve element; which has the valve cavity formed in inside of the spherical surface, and this cavity as a whole, and this cavity has an equal diameter substantially with the diameter of this diaphram.
[Claim 29] They are the valve element which has in inside the valve cavity formed of a curvilinear side, and the radius diaphragm valve which changes including the annular diaphram which seals this cavity as a whole, and has the depth with; this cavity about equal to the one half of the diameter of this diaphram.
[Claim 30] The valve element which has a spherical valve cavity in inside, and opening which opens to this valve cavity; this opening is a radius diaphragm valve which changes including the annular valve seat which is an ellipse and adjoins; and this opening, and which beveled.
[Claim 31] It is the radius diaphragm valve which answers flow back pressure [as opposed to / are the interior which attached the taper to radial in order that this diaphram mandril might form a lip with this mandril chip, and / this mandril in; this lip], and generates the closing force by changing including annular diaphram with the diaphram mandril and mandril lip for sealing the valve cavity which has opening in inside, and this opening as a whole.
[Claim 32] Valve element which has in inside the valve cavity defined by the spherical side;
Diaphram which has the perimeter which seals this valve cavity;
The 1st fluid channel in this valve element opened to this valve cavity by the 1st lot, and the 2nd fluid

channel in this valve element opened to this valve cavity by the 2nd lot;
It changes by ******,
This diaphram has the valve mandril which opens a valve and closes.;
this valve mandril of this closing location -- this -- the part of this curved surface that surrounded the 1st lot and vacated spacing for radial from them -- receiving -- sealing --; -- the radius diaphragm valve whose depth of this ball is the abbreviation one half of the diameter of this diaphram here.
[Claim 33] Valve element which has in inside the valve cavity defined by the spherical side;
Diaphram which has the perimeter which seals this valve cavity;
The 1st fluid channel in this valve element opened to this valve cavity by the 1st lot, and the 2nd fluid channel in this valve element opened to this valve cavity by the 2nd lot;
It changes by ******,
This diaphram has the valve mandril sealing face which opens a valve and closes.;
this valve mandril of this closing location -- this -- the part of this curved surface that surrounded the 1st lot and vacated spacing for radial from them -- receiving -- sealing --; -- the radius diaphragm valve these whose sealing faces are or less about 5 of the diameter of this cavity / 8 here.
[Claim 34] Valve element which has in inside the valve cavity defined by the spherical side;
Diaphram which has the perimeter which seals this valve cavity;
The 1st fluid channel in this valve element opened to this valve cavity by the 1st lot, and the 2nd fluid channel in this valve element opened to this valve cavity by the 2nd lot;
It changes by ******,
By movement of the valve mandril which met the shaft in the stroke defined beforehand, this diaphram opens a valve and has the closed valve mandril.;
this valve mandril of this closing location -- this -- the part of this curved surface that surrounded the 1st lot and vacated spacing for radial from them -- receiving -- sealing --; -- the radius diaphragm valve this whose stroke is below abbreviation one half of the radius of this diaphram here.
[Claim 35] It is the valve element to which it has valve cavity; and the diaphram valve element sealing side annular as a whole which are formed in inside of a spherical side in inside, and this cavity has an equal diameter substantially in the diameter of this diaphram valve element sealing side.
[Claim 36] It is the valve element which has the valve cavity formed in inside of a spherical side, and the depth whose; this cavity is the abbreviation one half of the diameter of this diaphram valve element sealing side with an annular diaphram valve element sealing side generally.
[Claim 37] Opening and this opening which are opened to a spherical valve cavity and this valve cavity to inside are a valve element with the annular valve seat which is an ellipse and adjoins; and this opening and which beveled.
[Claim 38] The valve element which has the valve cavity as which a cavity is substantially determined by the semicircle spherical surface, and which has the 1st and the 2nd lot in inside.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1 A]

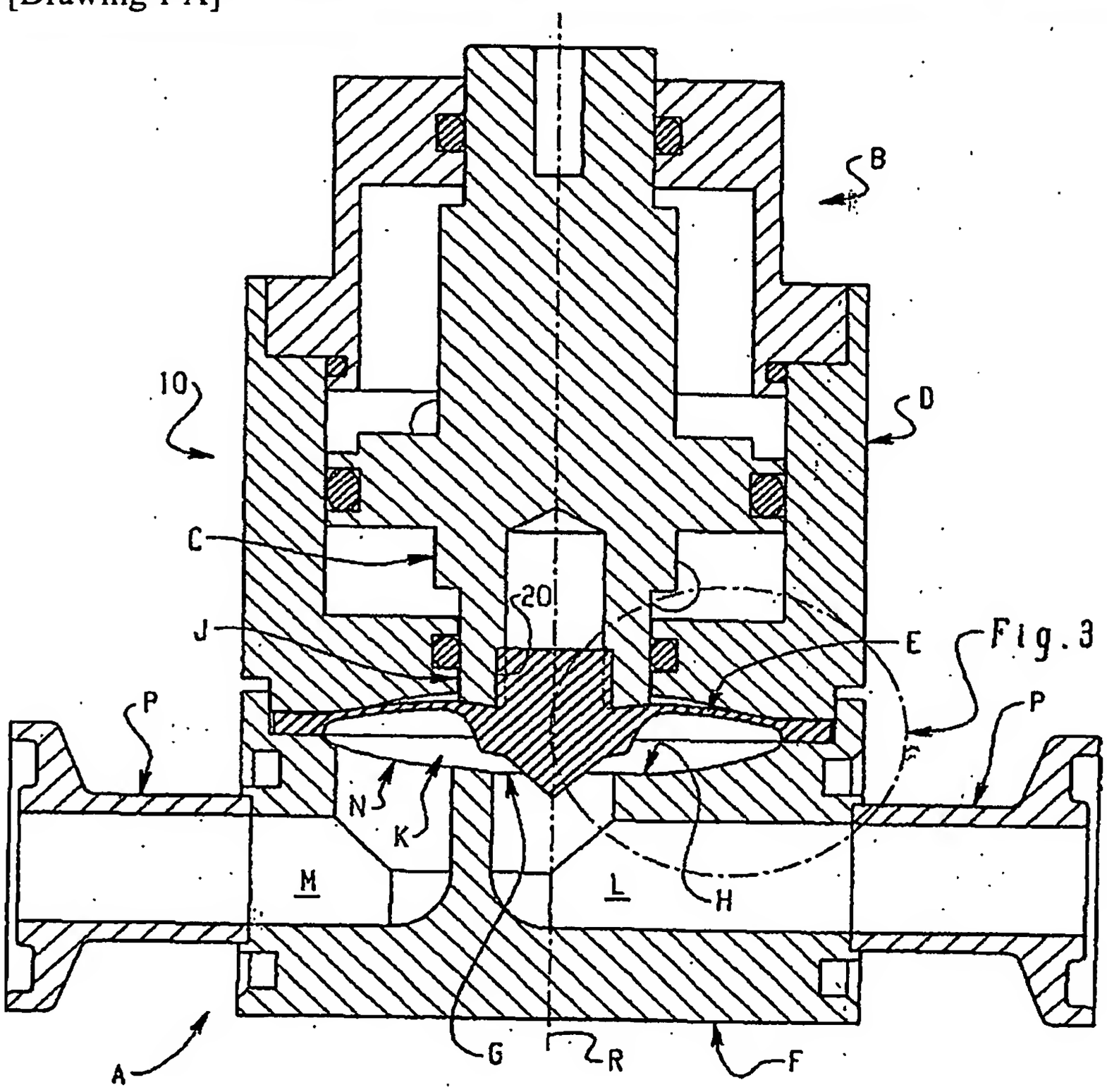


Fig. 1A

Fig. 3

[Drawing 1 B]

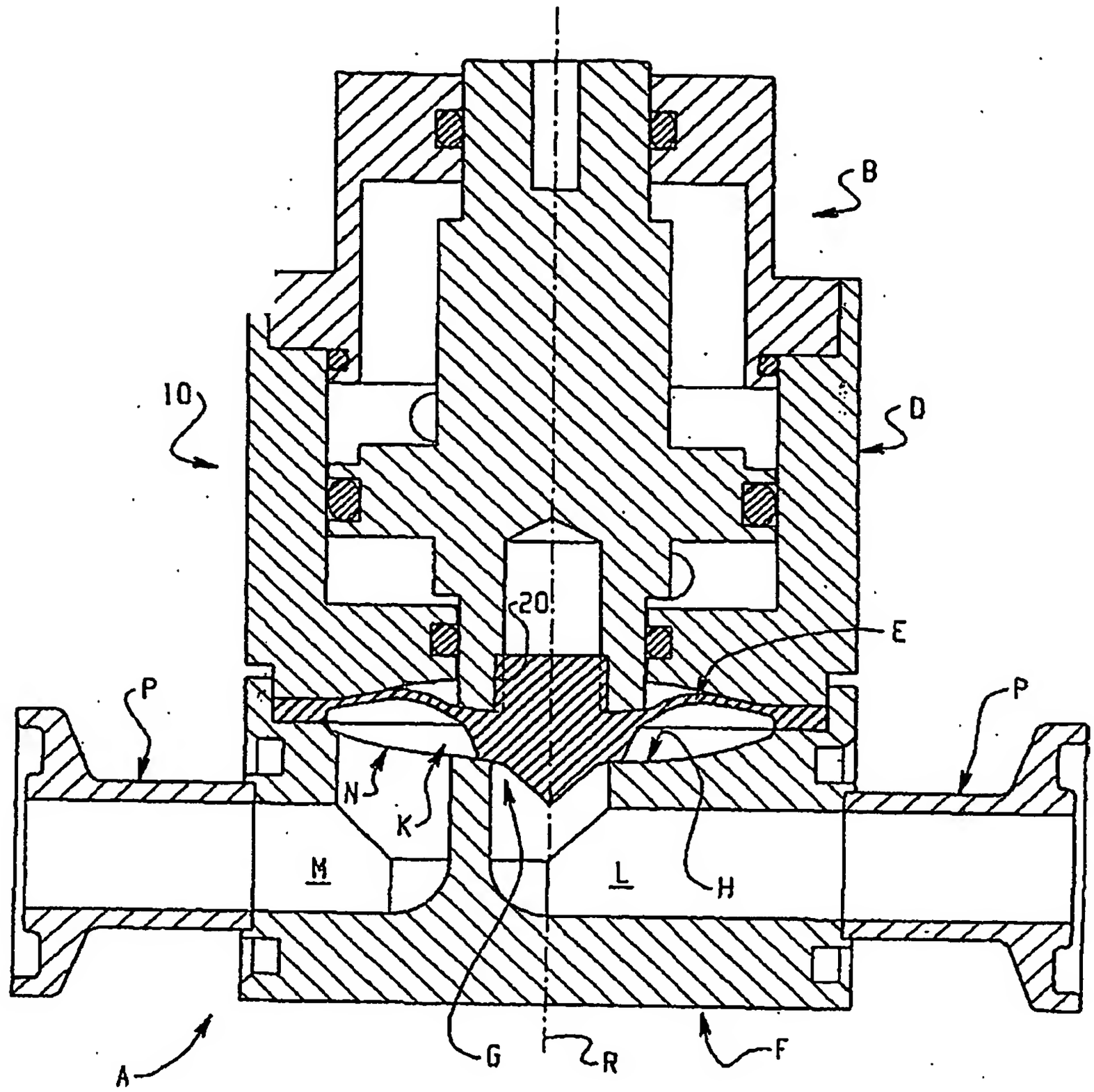


Fig. 1B

[Drawing 2 A]

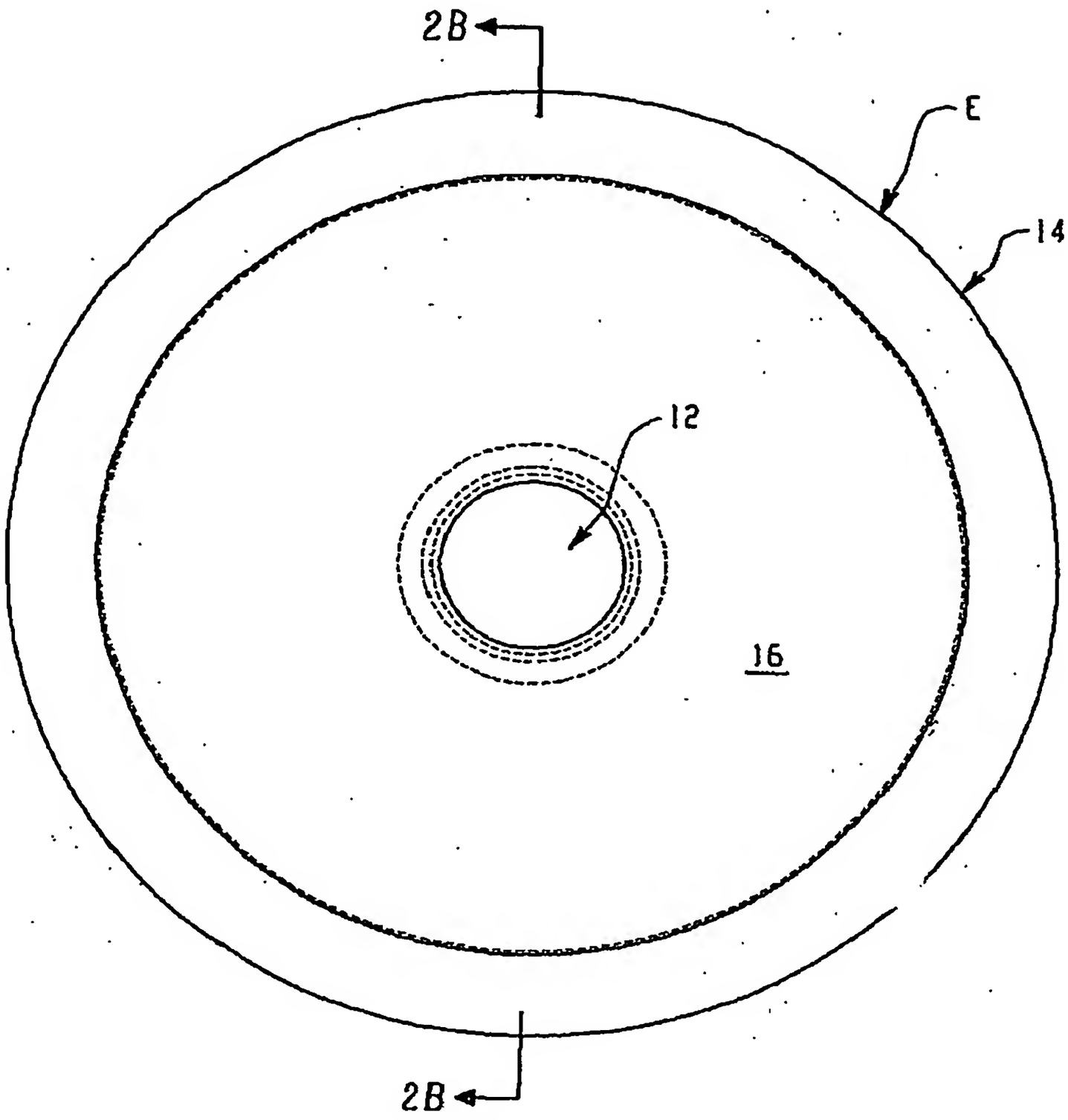


Fig. 2A

[Drawing 2 B]

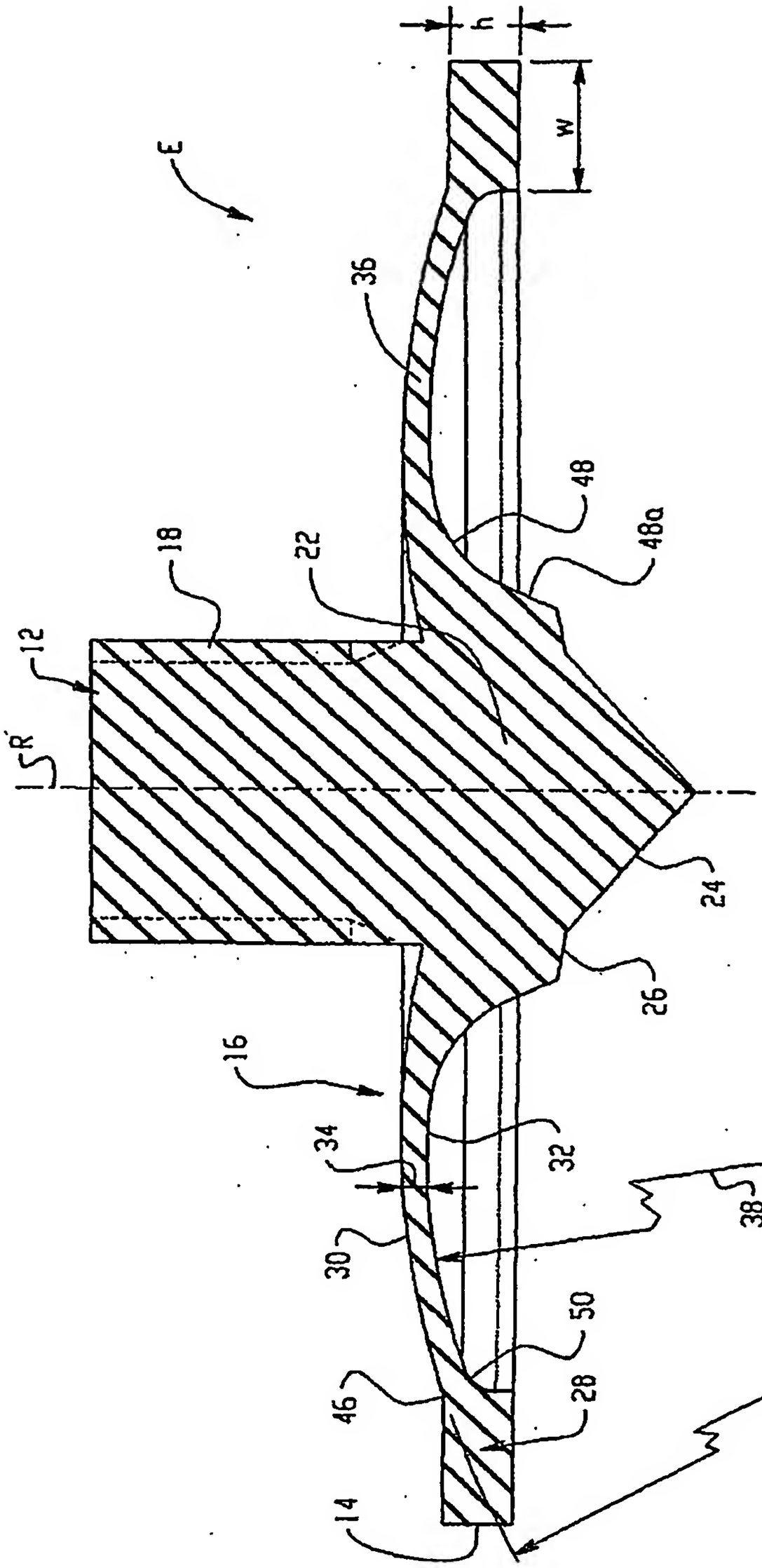


Fig. 2B

[Drawing 3]

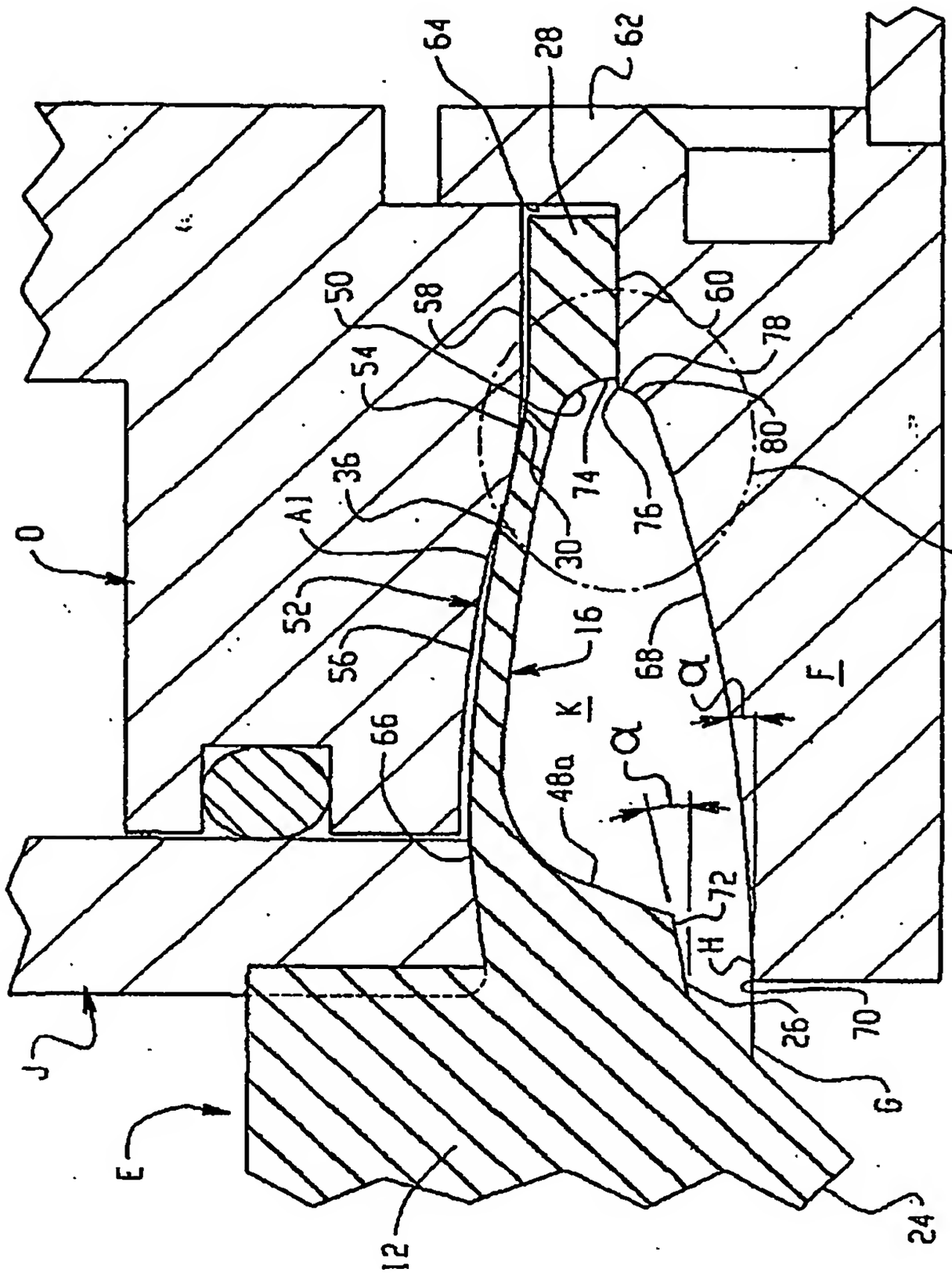


Fig. 3

Fig.5

[Drawing 4]

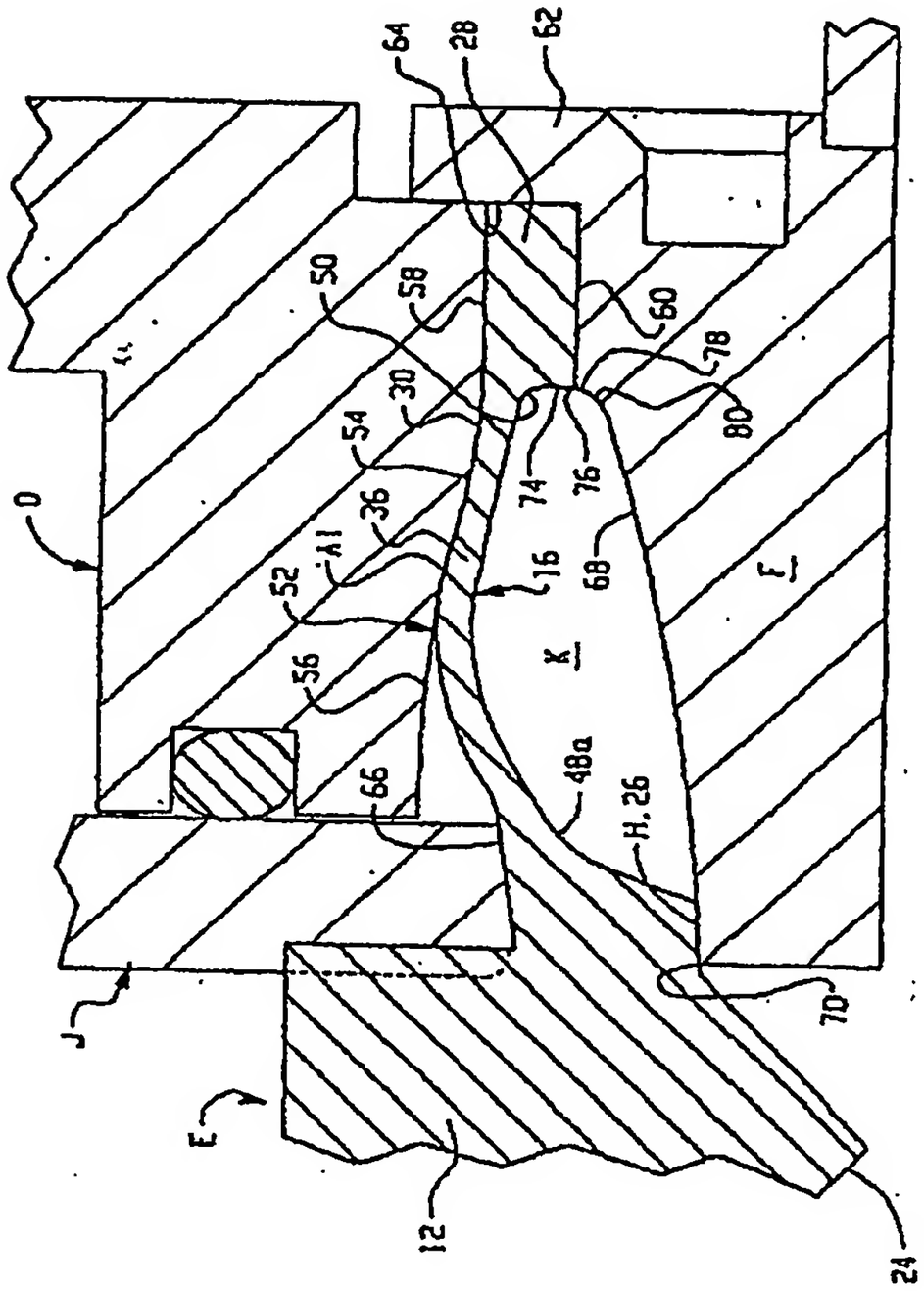


Fig. 4

[Drawing 5]

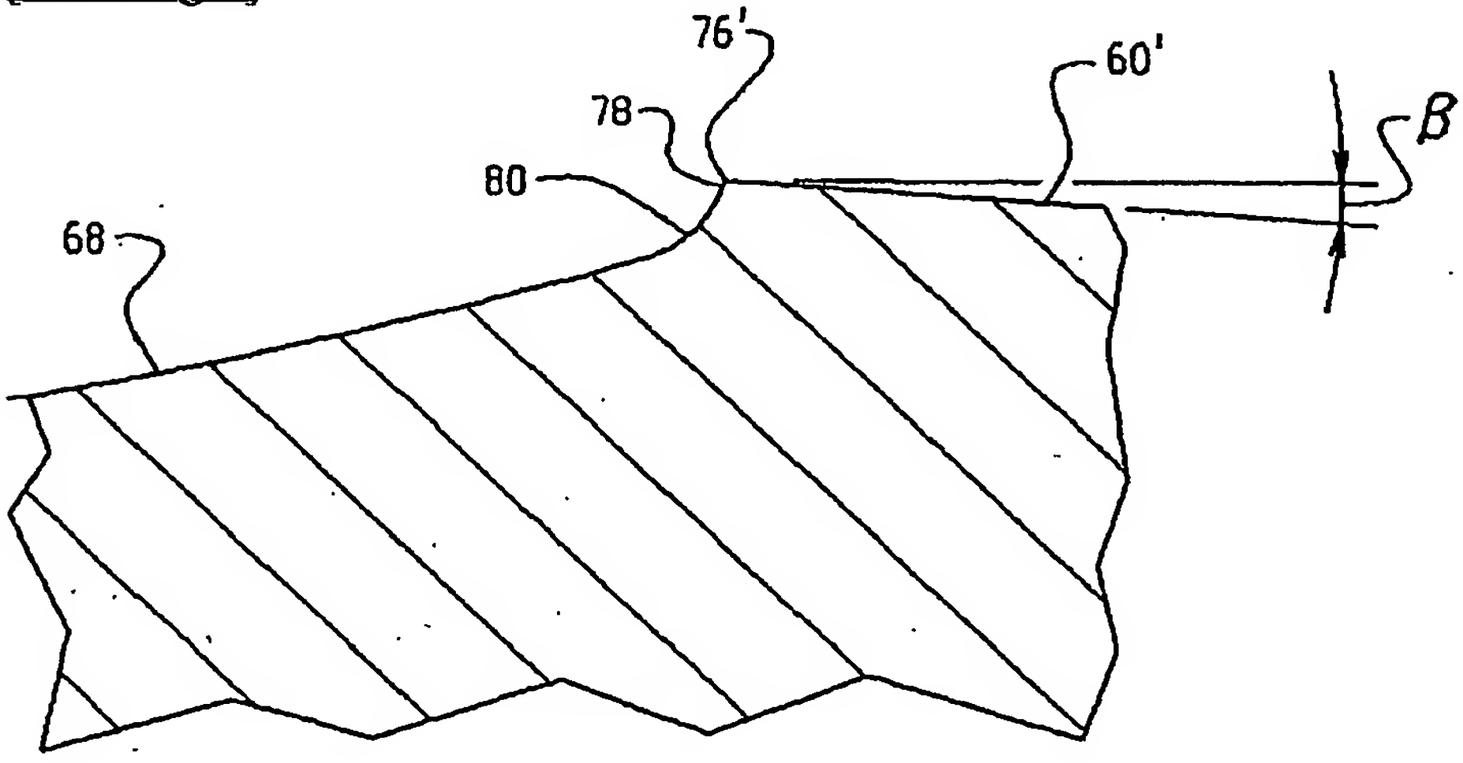


Fig. 5

[Drawing 6]

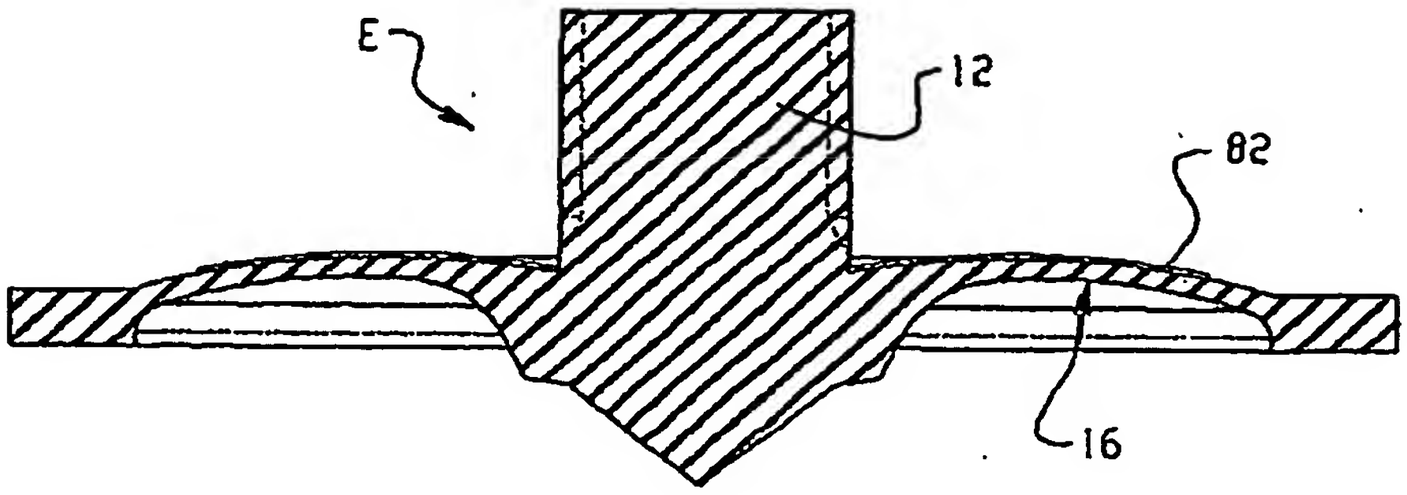


Fig. 6

[Drawing 7 A]

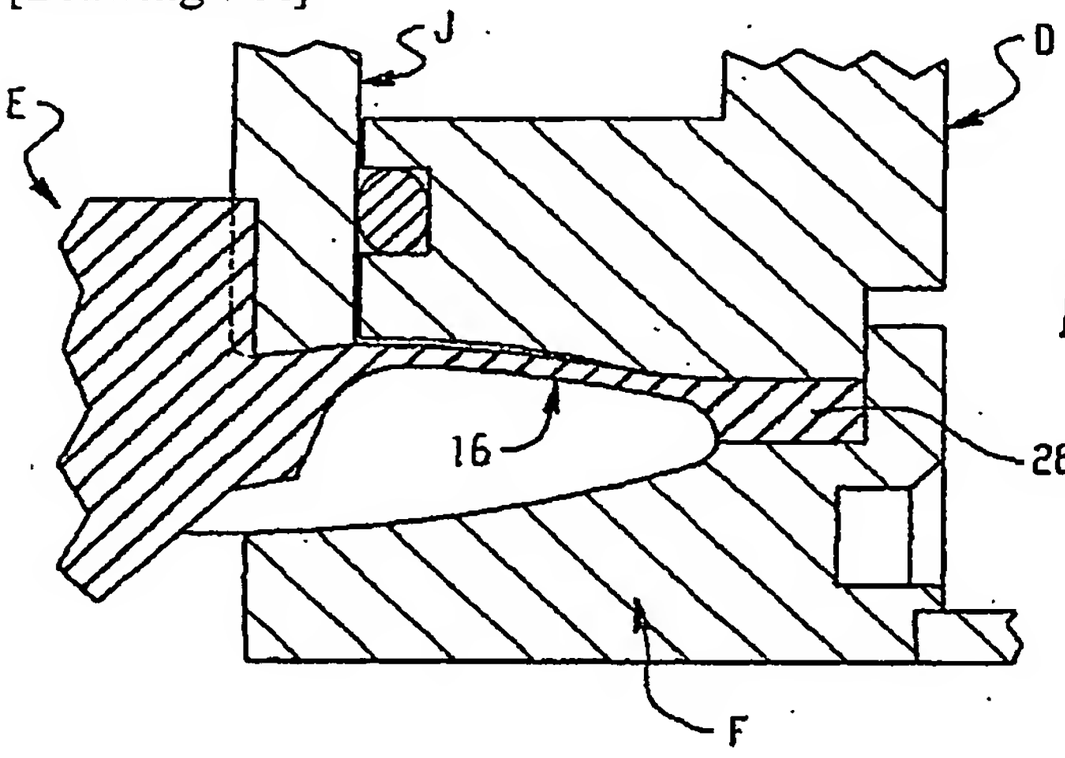


Fig. 7A

[Drawing 7 B]

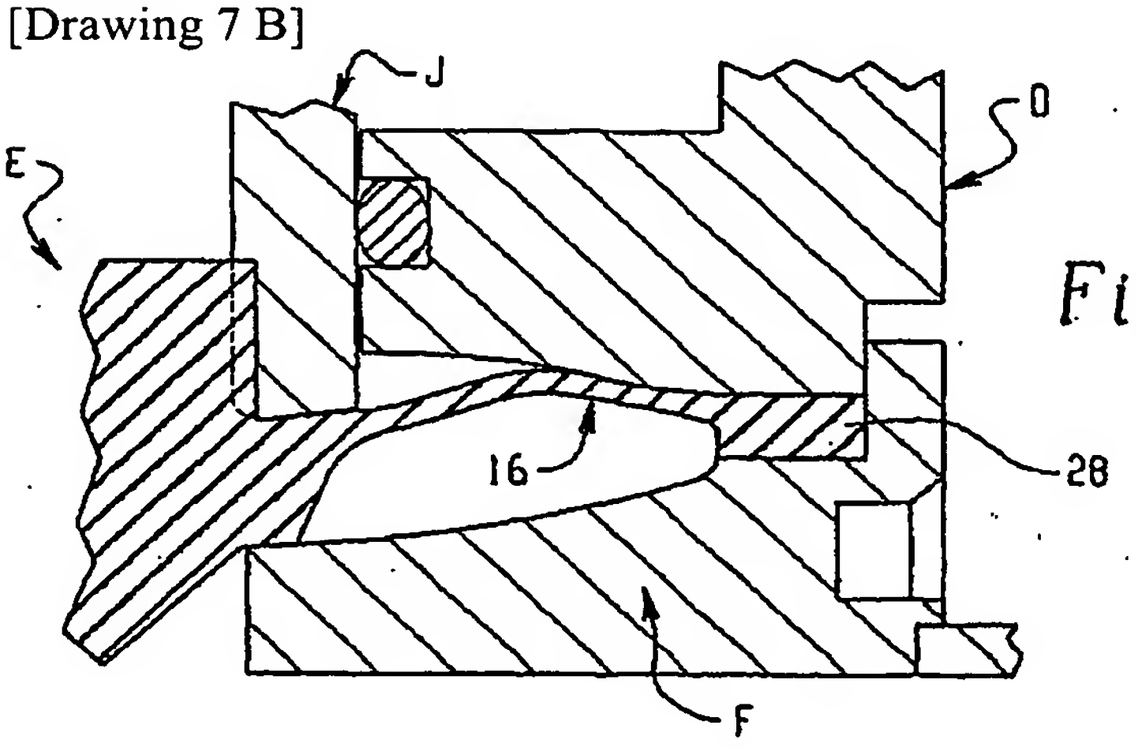


Fig. 7B

[Drawing 7 C]

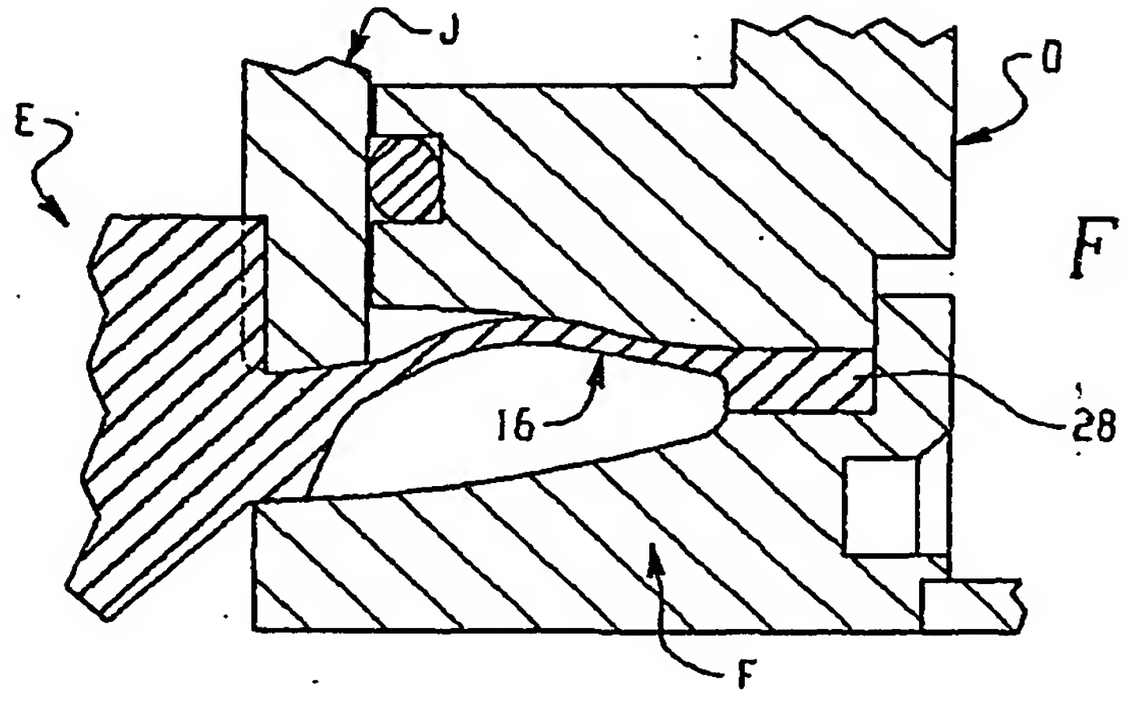


Fig. 7C

[Drawing 8]

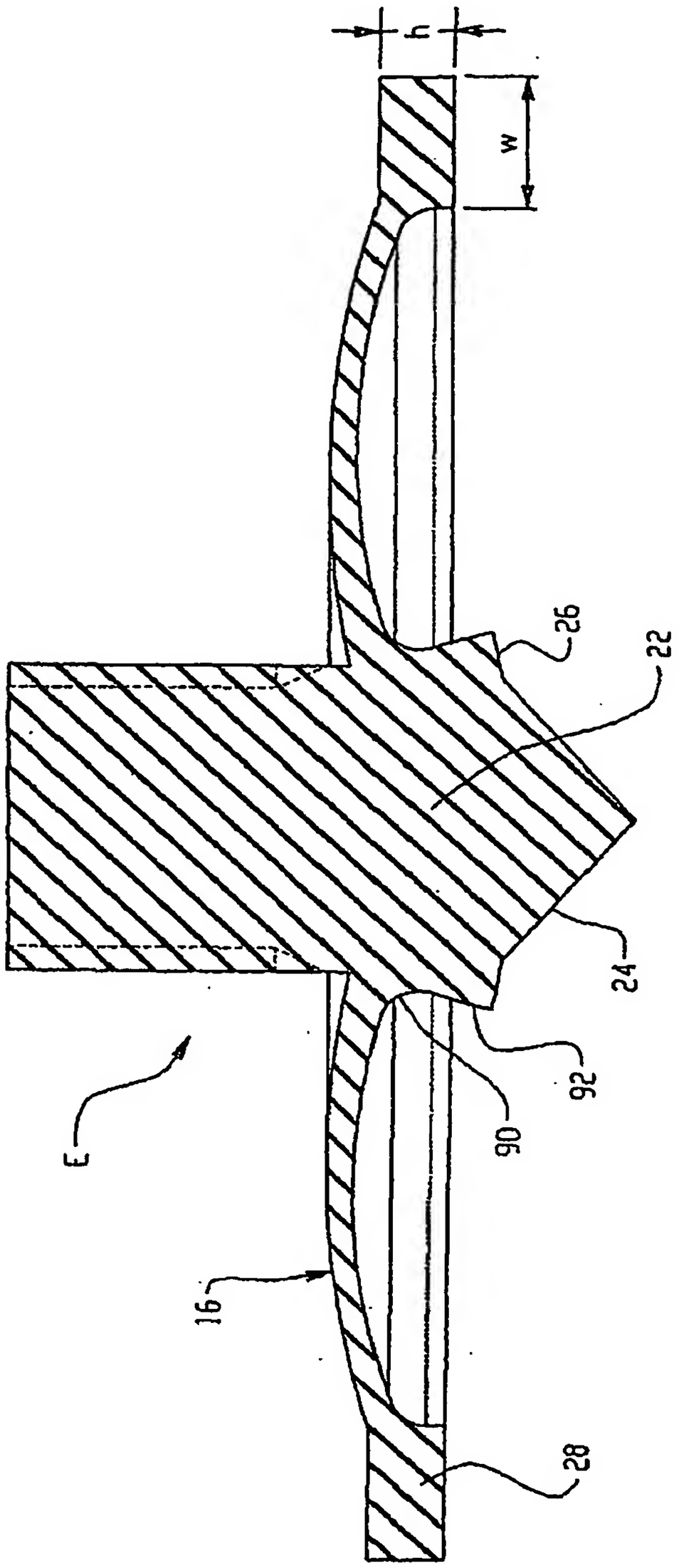


Fig. 8

[Drawing 9 A]

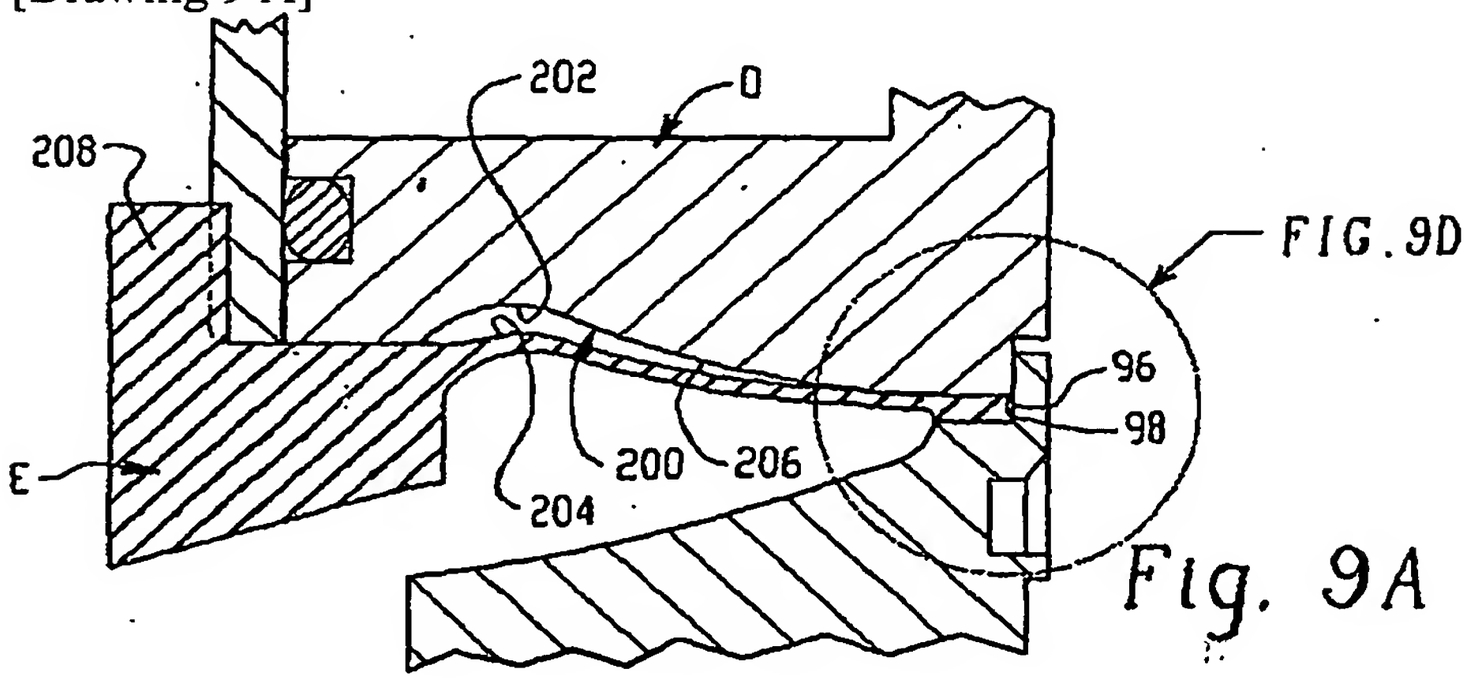


Fig. 9A

[Drawing 9 B]

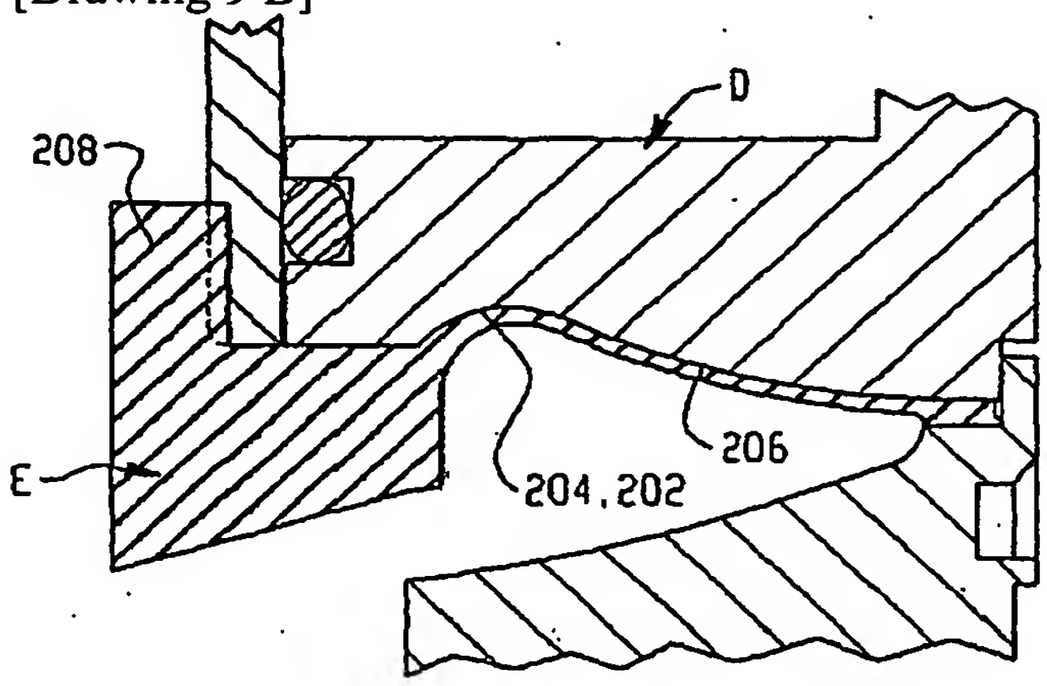


Fig. 9B

[Drawing 9 C]

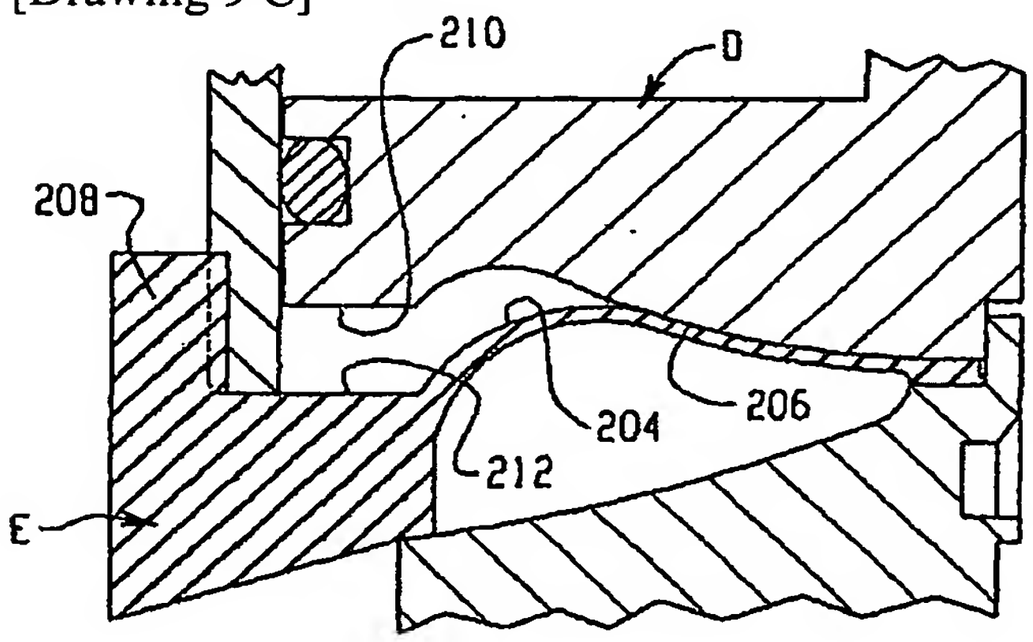


Fig. 9C

[Drawing 9 D]

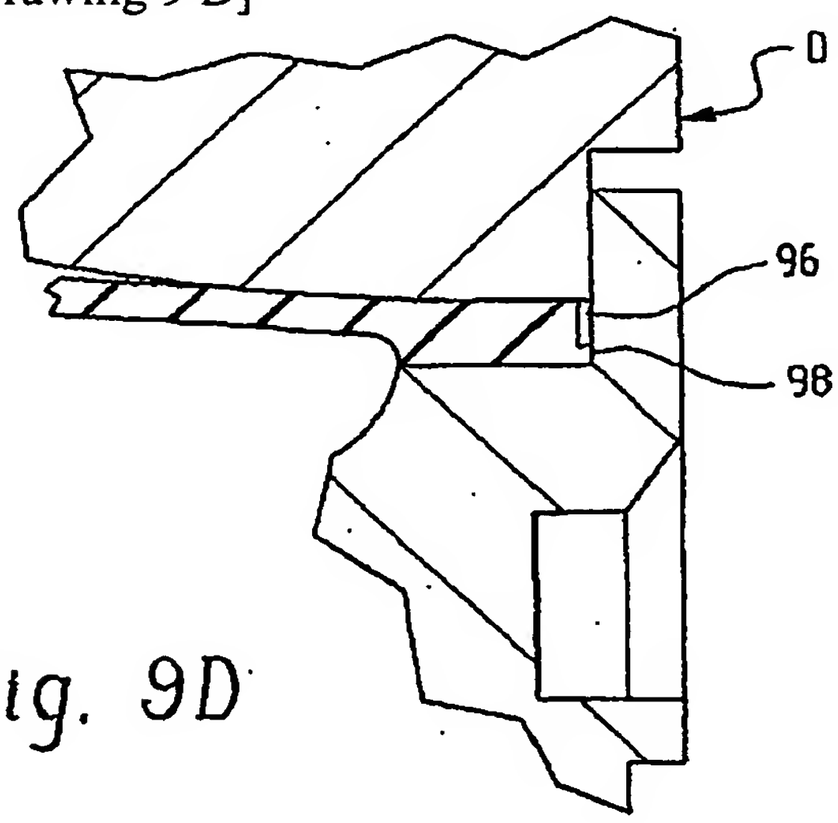


Fig. 9D

[Drawing 10 A]

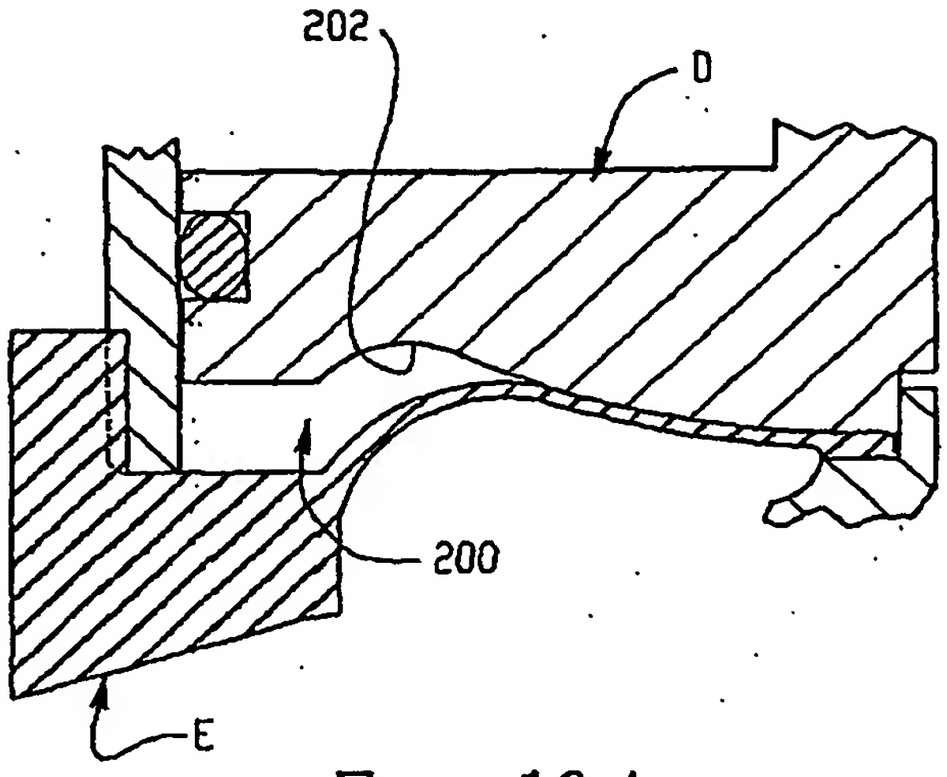


Fig. 10A

[Drawing 10 B]

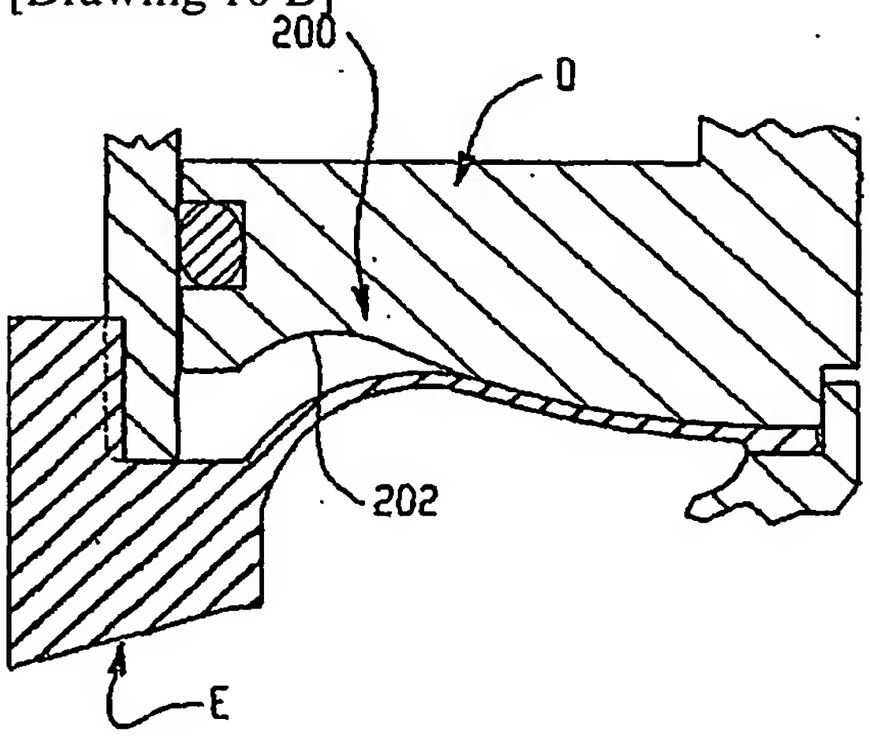


Fig. 10B

[Drawing 10 C]

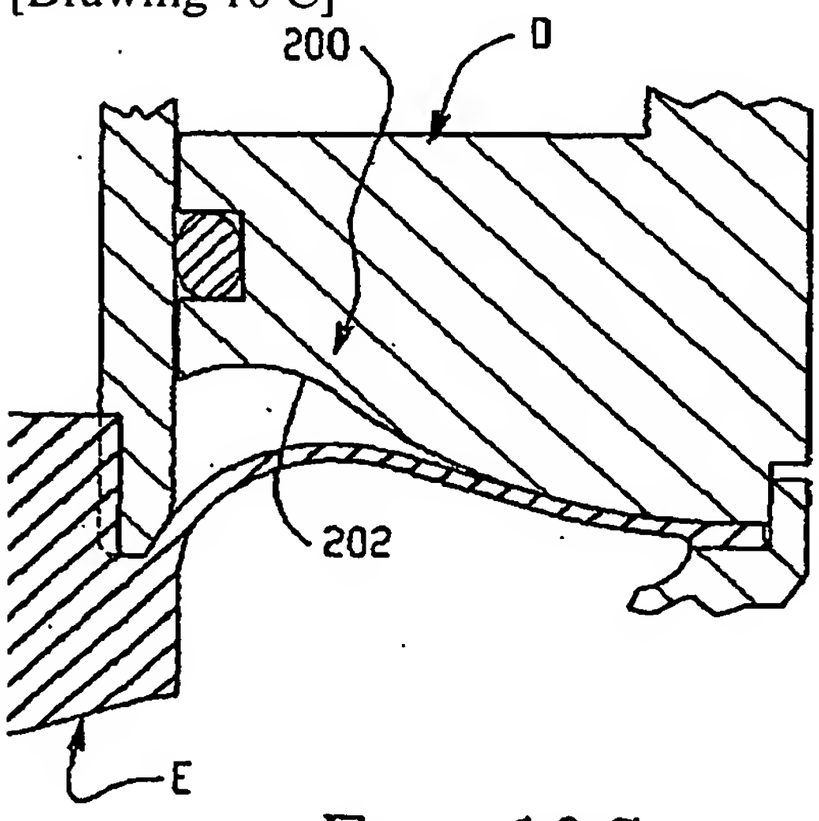


Fig. 10C

[Drawing 10 D]

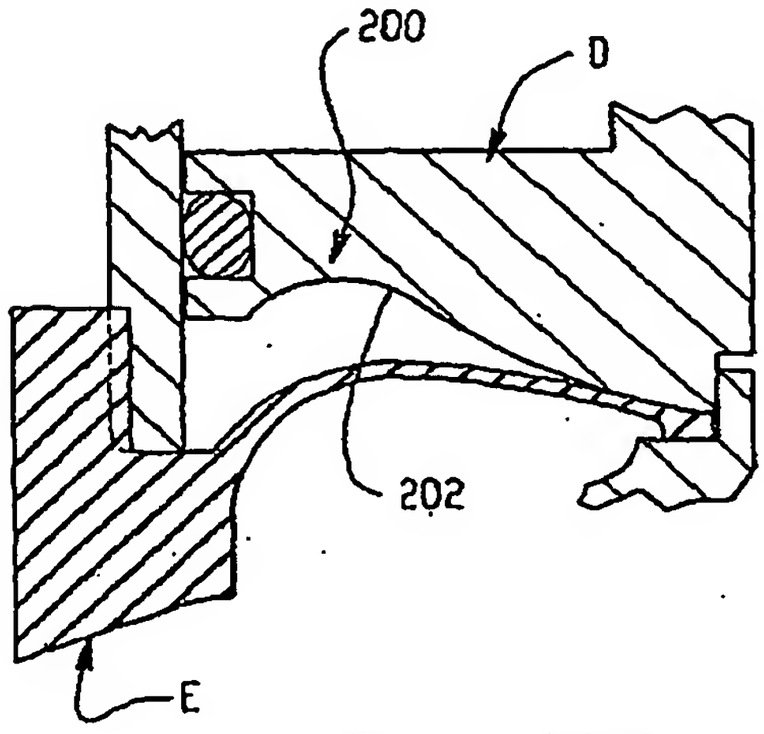


Fig. 10D

[Drawing 10 E]

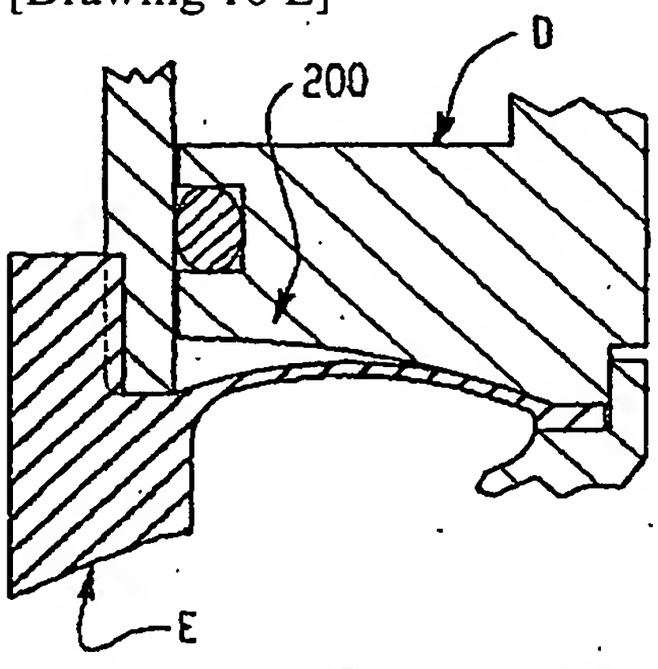


Fig. 10E

[Drawing 11]

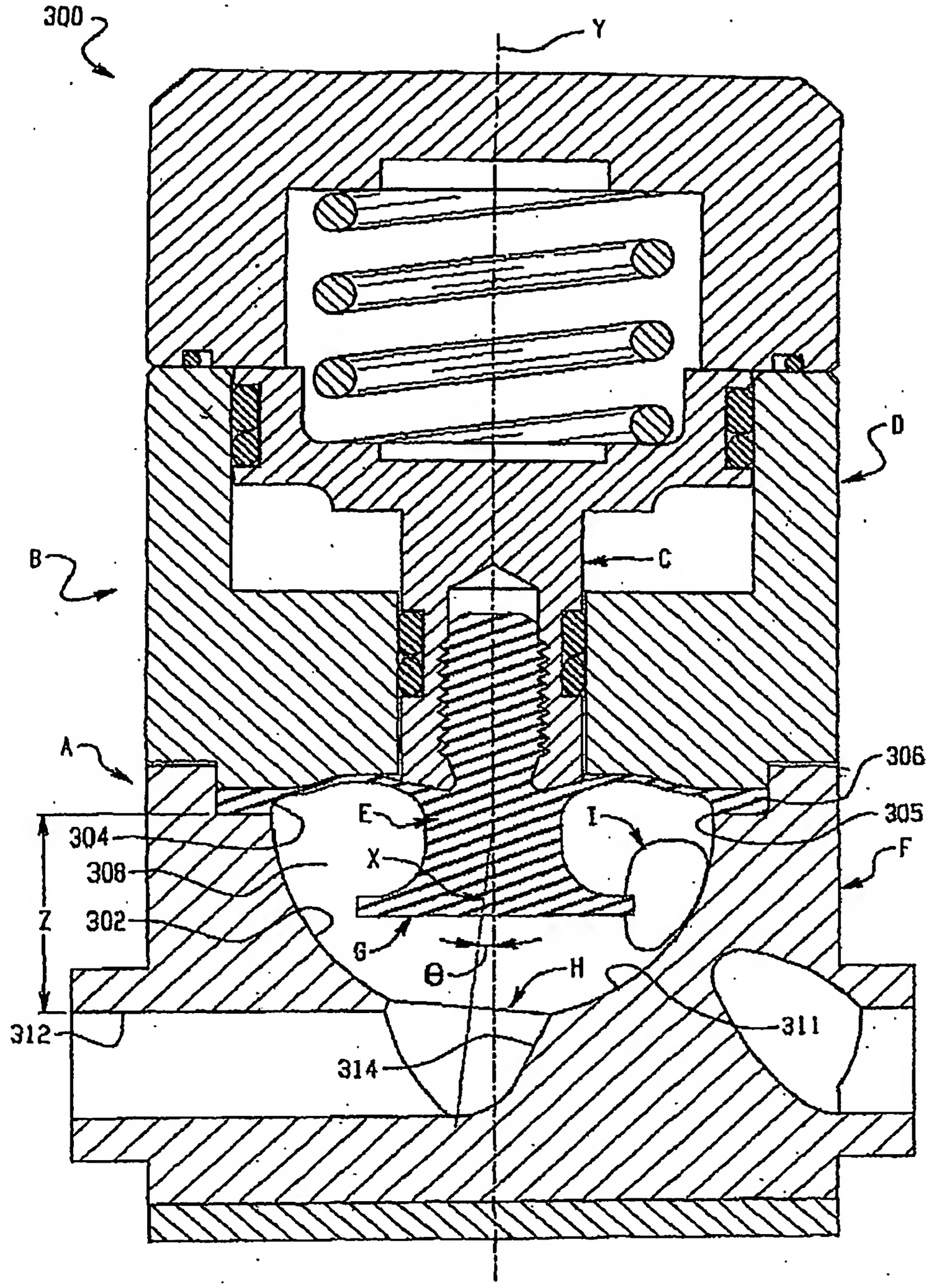


Fig. 11

[Drawing 12]

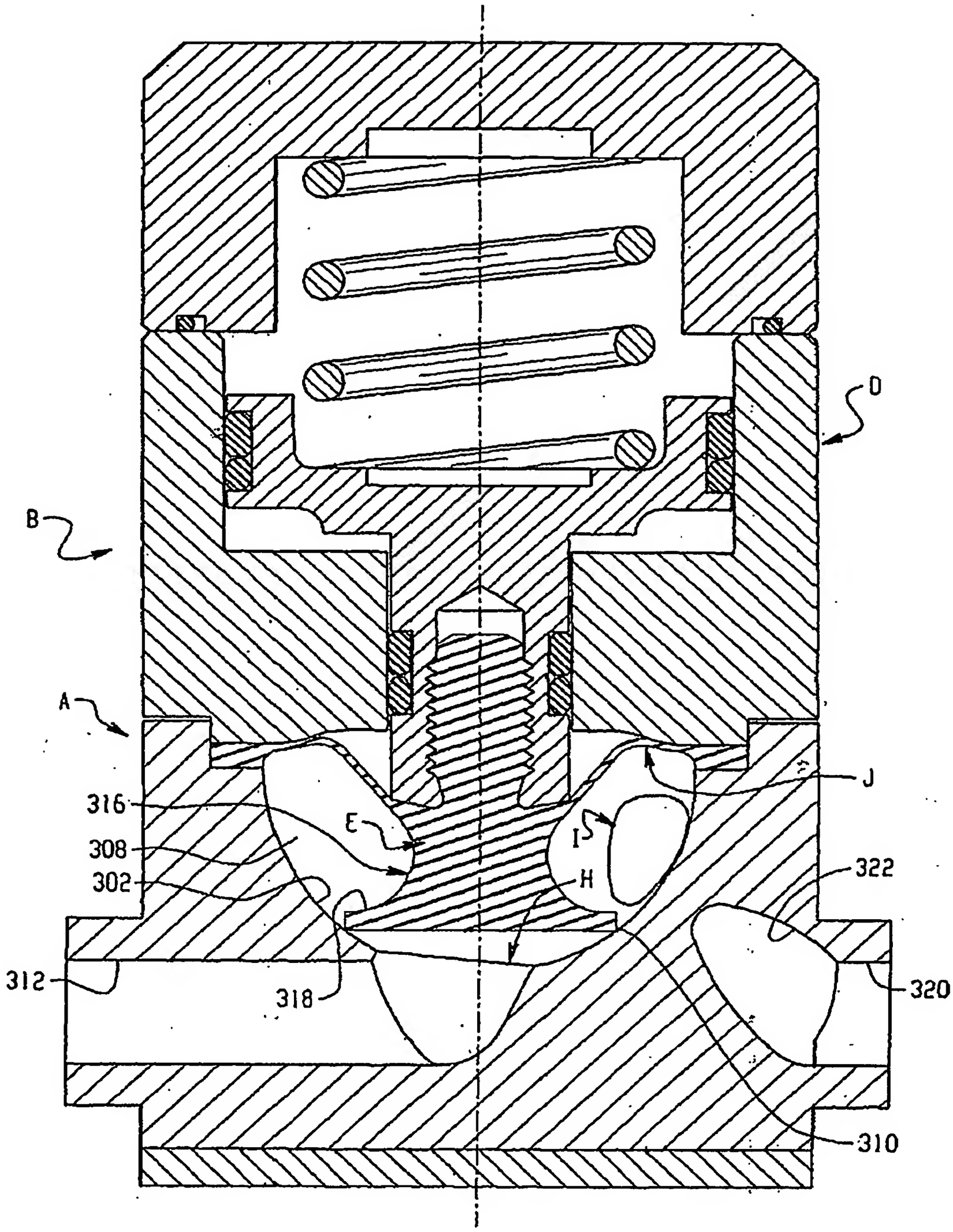


Fig. 12

[Drawing 13]

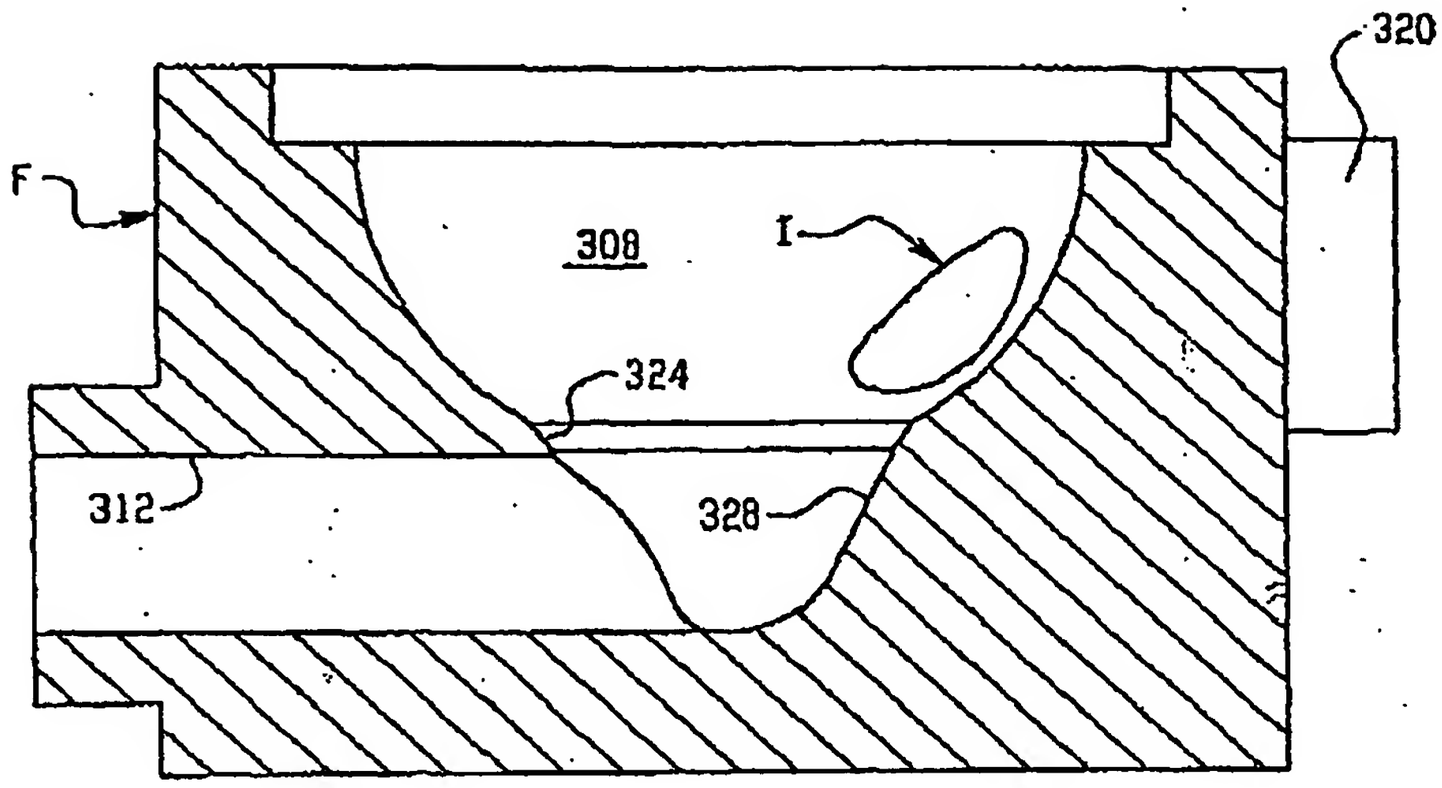


Fig. 13

[Drawing 14]

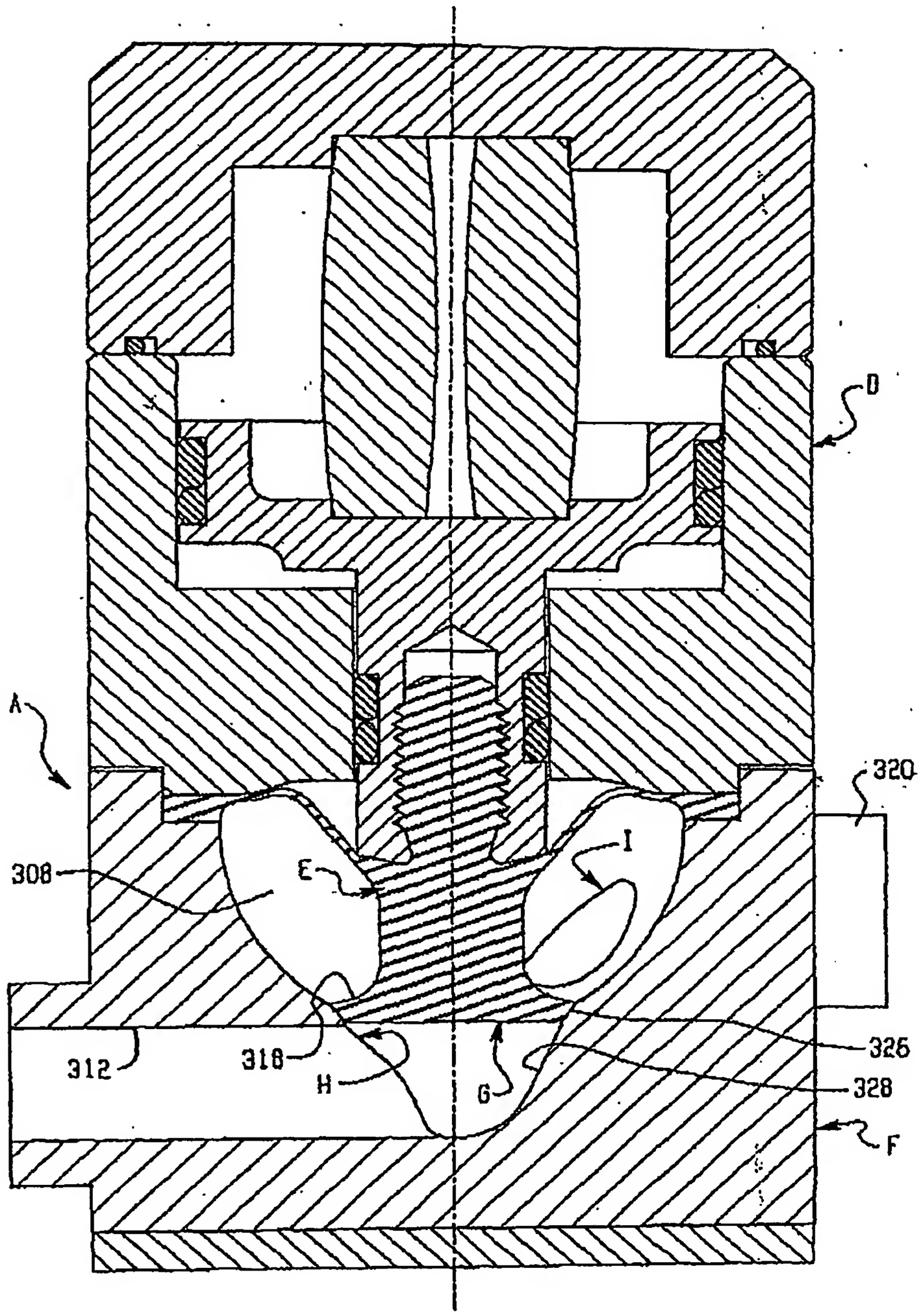
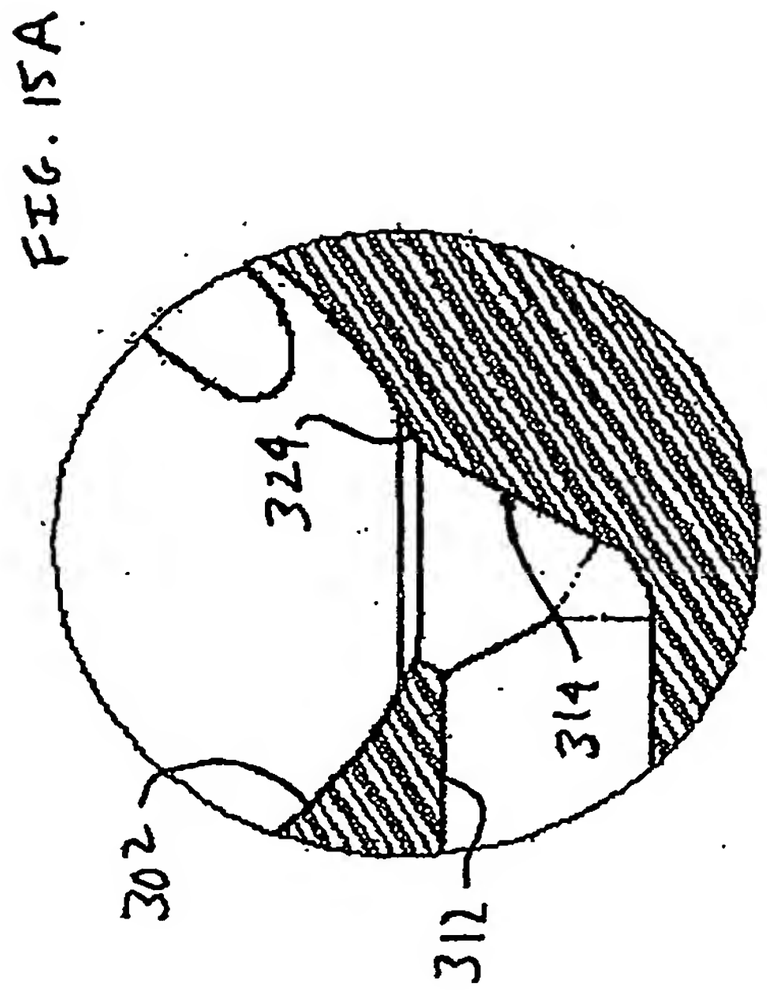


Fig. 14

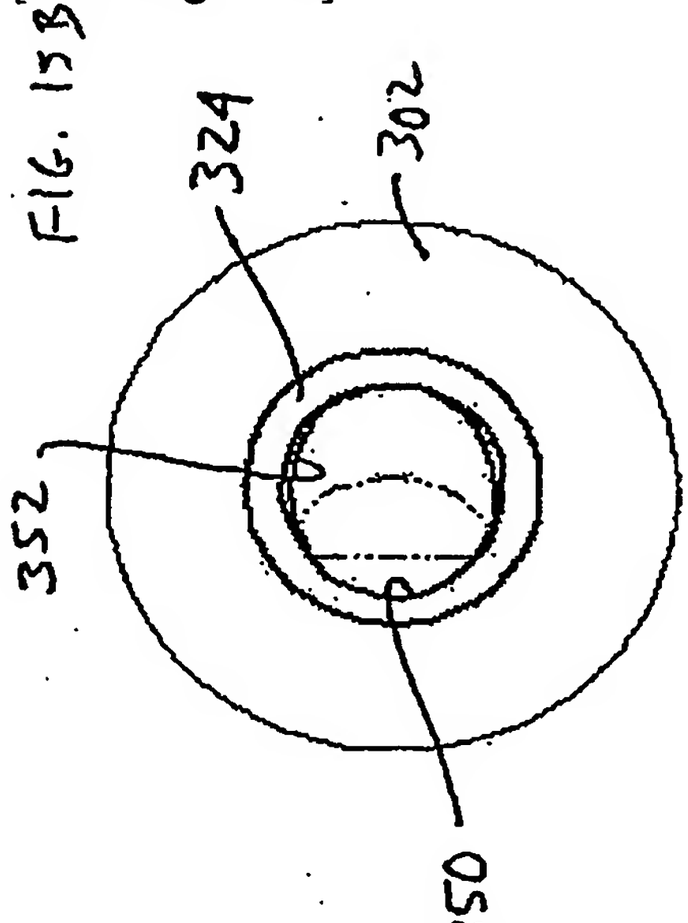
[Drawing 15 A]

FIG. 15A



[Drawing 15 B]

FIG. 15B



[Drawing 16]

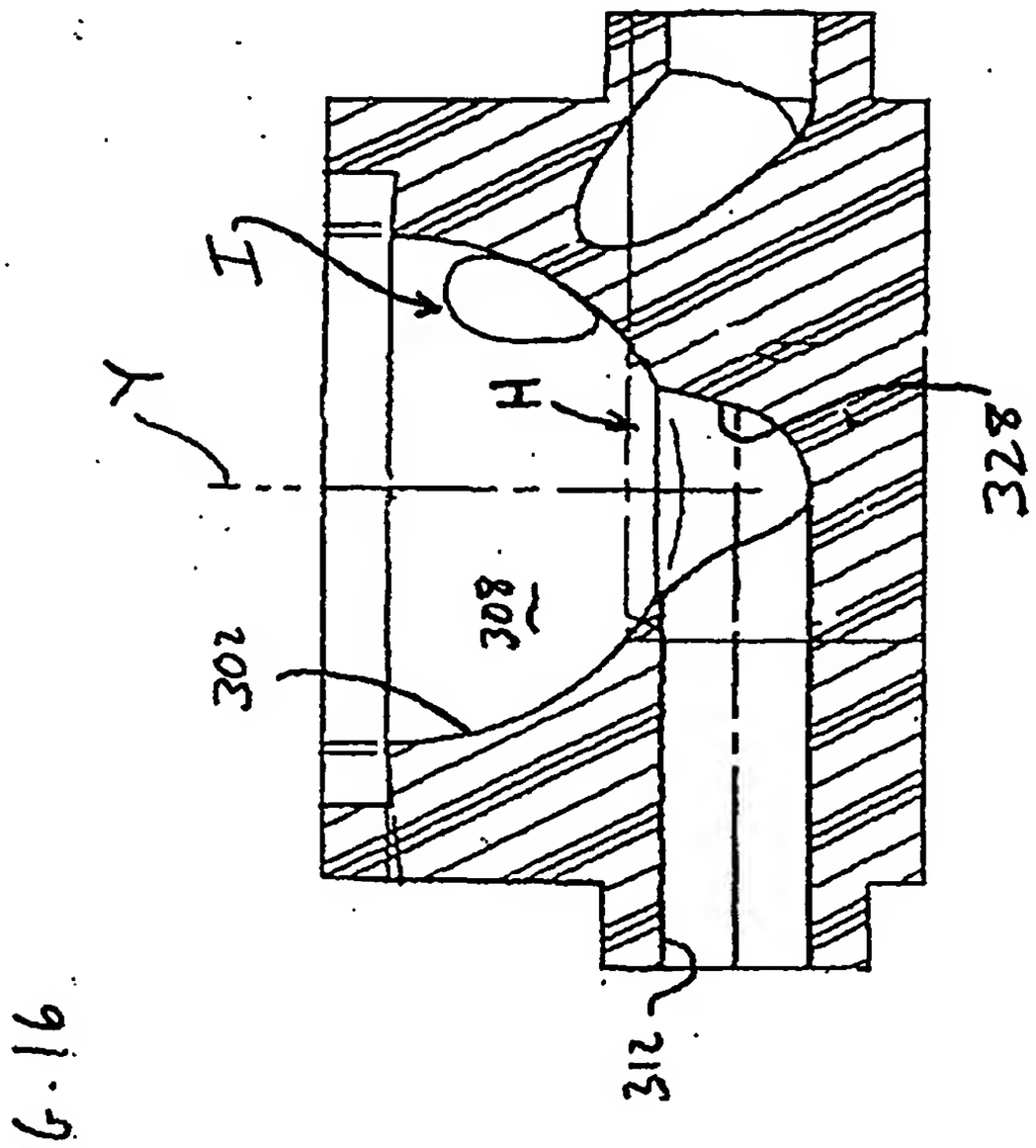


FIG. 16

[Translation done.]